

**PHASE 1 NEAR SURFACE GEOTECHNICAL INVESTIGATION FOR
THE PROPOSED TOWNSHIP ESTABLISHMENT TO BE SITUATED
ON PORTION 1 OF THE FARM NEWINGTON 255 KU,
MPUMALANGA PROVINCE OF SOUTH AFRICA**

	
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TABLE OF CONTENT

TABLE OF CONTENT	ii
LIST OF FIGURES	iii
LIST OF TABLES.....	iii
ACRONYMS AND ABBREVIATIONS	iv
EXECUTIVE SUMMARY	v
1. INTRODUCTION.....	1
1.1 Purpose.....	1
1.2 Background	1
2. SITE DESCRIPTION.....	2
2.1 Location	2
2.2 Topography	3
2.3 Climate.....	3
3. GEOHAZARDS	4
3.1 Seismic Hazard / Activities	4
3.2 Ground Subsidence.....	6
3.3 Sinkhole Formation	6
3.4 Landslides and Mudslides	7
3.5 Falls and Rockslides	7
3.6 Volcanic Activities.....	7
4. METHOD OF INVESTIGATION	7
4.1 Desk Study.....	7
4.2 Test Pits	8
4.3 Laboratory Tests	11
5. REGIONAL & SITE GEOLOGY.....	15
5.1 Regional Geology.....	15
5.2 Site Geology.....	15
5.2.1 Topsoil	16
5.2.2 Residual soil.....	16
5.2.3 Granite Bedrock	16
6. HYDROGEOLOGY	16
6.1 Seepage and Groundwater	16
7. GEOTECHNICAL EVALUATION.....	17
7.1 Expansive soils.....	19
7.2 Collapsible soil	19



7.3	Compressible soils	19
7.4	Soil site classification.....	19
7.5	Construction Monitoring.....	21
8.	RECOMMENDATIONS	21
8.1	Foundations	21
8.1.1	Foundations on residual soils	21
8.1.2	Foundations on weathered Granite	22
9.	CONCLUSIONS	22
10.	REPORT PROVISIONS	22
11.	REPORT SIGNATURE.....	24
12.	REFERENCES.....	25
13.	APPENDIX A: SITE PICTURES	26
14.	APPENDIX B: LABORATORY RESULTS	32
15.	APPENDIX C: SOIL PROFILES	33
16.	APPENDIX D: SITE LAYOUT PLAN	34

LIST OF FIGURES

Figure 1: Location of the proposed site (Topographic Map 2431CD).....	3
Figure 2: Seismic hazard map of South Africa (I)	5
Figure 3: Seismic Hazard Zones of South Africa (SANS 10160-4, 2011)	6
Figure 4: Test pit position	11
Figure 5: Geological setting of the site	15
Figure 6: Water seepage map.....	17
Figure 7: Geotechnical zone/ soil class designation	20

LIST OF TABLES

Table 1: Summary of test pit information	8
Table 2: Summary of the foundation test results	13
Table 3: Summary of the CBR test results	16
Table 4: Residential site class designations	17
Table 5: Geotechnical classification for urban development (GFSH-2 Document).....	18



ACRONYMS AND ABBREVIATIONS

AASHTO : American Association of State Highway and Transportation Officials

ARS : Acceleration Response Spectra

DCP : Dynamic Cone Penetrometer

DSI : Dolomite Stability Investigation

CBR : Californian Bearing Ratio

M : Meter

MDD : Maximum Dry Density

MBGL : Meters Below Ground Level

NHBRC : The National Home Builders Registration Council

OMC : Optimum Moisture Content

CL : Clay

TP : Trial Pit

TLB : Tractor Loader Backhoe

SANS : South African National Standards

SANAS : South African National Accreditation System

SACNASP : South African Council Natural Scientific Professions

USC : Unified Soil Classification



EXECUTIVE SUMMARY

The project is the proposed township establishment to be situated on portion 1 of the farm Newington 255 KU. The site is located at the following approximate coordinates: Latitude 24°46'53"S and Longitude 31°18'54"E, time zone is GMT+2 hours. The area of interest for investigation is situated between villages of Dumphries, and Matshaye, access to site is via the unnamed gravel which connects the Dumphries and Matshaye Village. The site is 15km northeast of Thulamahashe in Mpumalanga Province.

Forty Six (46) test pits were excavated by means of Tractor loader Backhoe (TLB) in order to obtain information on the subsurface soil. Each test pit which was deemed safe to enter was marked, photographed and profiled by a field engineering geologist in accordance with the "Guidelines for Soil and Rock Logging in South Africa", 2nd Impression 2002, sampled as necessary and then loosely backfilled. Test pit soil profiles are attached in Appendix C.

Twelve bulk samples were collected from the slightly moist, light brown, Coarse grained, **gravelly SAND**. The granite bedrock was slightly weathered and fractured. The bedrock was friable and excavatable as gravel size fragments. The granite grades with depth from slightly weathered medium hard rock to consolidated high strength **granite bedrock**. Homogeneity of material underlying the site was observed hence a choice of twelve bulk representative samples. The samples were found to be non-plastic. The PI along with the clay content indicated that the samples exhibit low potential expansiveness. The sample indicated CBR of 38 at 95% MOD AASHTO with a grading modulus of 2.0 for TP2, a CBR of 72 at 95% MOD AASHTO with a grading modulus of 1.9 for TP10. Based on the grading modulus, Atterberg limits and CBR the area under investigation were classified as G5 material. The area can be classified as Non-corrosive (NC). Having said that, does not mean corrosive materials (pipelines) installation must not include measures against corrosion.

The area investigated is underlain by top soils of sand, including residual soils derived from the in-situ weathering of Granite. Residual soil from Granite is well developed and was encountered in the entire site an average depth of 1.9m below existing ground level. The excavation on site is likely to classify as "soft" to an average depth of 1.9m below existing ground level. Below this, "intermediate to hard" excavation is expected. This due to the underlining granite bedrock

A review of the test pit data indicates that the site is generally underlined by granite bedrocks. The laboratory tests indicated that material underlying the site exhibits low potential expansiveness. The development potential has been broadly classified in terms of



a Geotechnical Sub-Area based on field observations/investigation (geological, hydrogeological, and geomorphological), and laboratory soil testing of soil samples. From the above discussion the site is classified into main soil area namely compressible and potential collapsible soils: According to AASHTO and COLTO the soil samples were classified as A-1-b(0) and G5 respectively. **The foundation design options as per SANS10400 H- NHBRC soil symbol is “R/C/C1”.** **The recommended Foundation types in accordance with SANS 10400H- Normal Strip Foundation / Reinforced Deep Strip Foundation.**

Therefore, the recommended foundation type is a **reinforced strip foundation founded on a G5/G6 engineered soil mattress.** The in-situ material can be utilised for founding material as there are of G5 material on residual soils. Reinforcement should be designed by a competent person. Moreover, a **normal strip foundation** onto the medium hard rock granite.

During the construction phase, it is highly recommended that qualified personnel should regularly inspect and monitor, to track and record deviations in the actual foundation conditions from those predicted as reported in this geotechnical site investigation report



1. INTRODUCTION

Zwandazwashu Consulting Pty (Ltd) was appointed by Nkanivo Development Consultants to conduct phase 1 near surface geotechnical investigation for the proposed township to be situated on portion 1 of the farm Newington 255 KU, on behalf of Bushbuckridge Local Municipality of the Ehlanzeni District Municipality in Mpumalanga Province of South Africa.

1.1 Purpose

The primary objective of the investigation was to assess the soil and rock profile across the sites and obtain engineering parameters for the design of foundations for the development of proposed site.

This report evaluates the geotechnical characteristics associated with the underlying geology and any geotechnical constraints that might affect structural integrity of the subject property. It is also important to identify engineering properties' potential influence on the design, construction and operation of the intended infrastructures.

The main objective of the investigation was aimed at defining the founding materials and establishing broader geotechnical conditions and their suitability to the establishment of township. This report presents practical recommendations for site preparation (earthworks), soil and rock excavability and for the design and construction of foundations. The report provides geotechnical parameters on which the foundation and superstructure designs may be based. The geotechnical investigation was carried out in accordance with SAIEG and GFSH-2 guidelines and all NHBRC Home Building Manuals guidelines.

The terms of reference for this investigation are as follows:

- Present the fieldwork carried out during the geotechnical investigation;
- Provide an overview of the geology of the site;
- Discuss the soil profile encountered;
- Comment on the suitability of the site for the proposed development;
- Recommend specific foundations for the structure.
- Comment on groundwater (if encountered in the limits of investigation).
- Discuss the potential geotechnical limiting factors by determining the behaviour and suitability of soil/rocks and their effects on the intended development;

1.2 Background

The project area is approximately 88.41 hectares in extent, which is expected to yield approximately 562 stands



The engineering geotechnical investigation was carried out to determine the prevailing ground conditions below the site with a specific interest in the depth to a competent founding horizon.

The fieldwork for the engineering geotechnical investigation was carried out on the 13th of November 2020 and entailed the following:

- Site walkover reconnaissance followed by the following;
- Excavation of twenty seven (27) test pits across the site to a depth of refusal using a Tractor-Loader Backhoe (TLB);
- Recovery of selected disturbed samples for laboratory tests. Samples were sent to Civilab Booysen Johannesburg.

2. SITE DESCRIPTION

The project is the proposed township establishment to be situated on portion 1 of the farm Newington 255 KU. The area of interest for investigation is situated between villages of Dumphries, and Matshaye, access to site is via the unnamed gravel which connects the Dumphries and Matshaye Village. The site is 15km northeast of Thulamahashe in Mpumalanga Province. The magisterial of the site is Ehlanzeni District Municipality in Bushbuckridge Local Municipality.

2.1 Location

The site is located at the following approximate coordinates: Latitude 24°46'53"S and Longitude 31°18'54"E, time zone is GMT+2 hours. Figure 1 shows location of site.

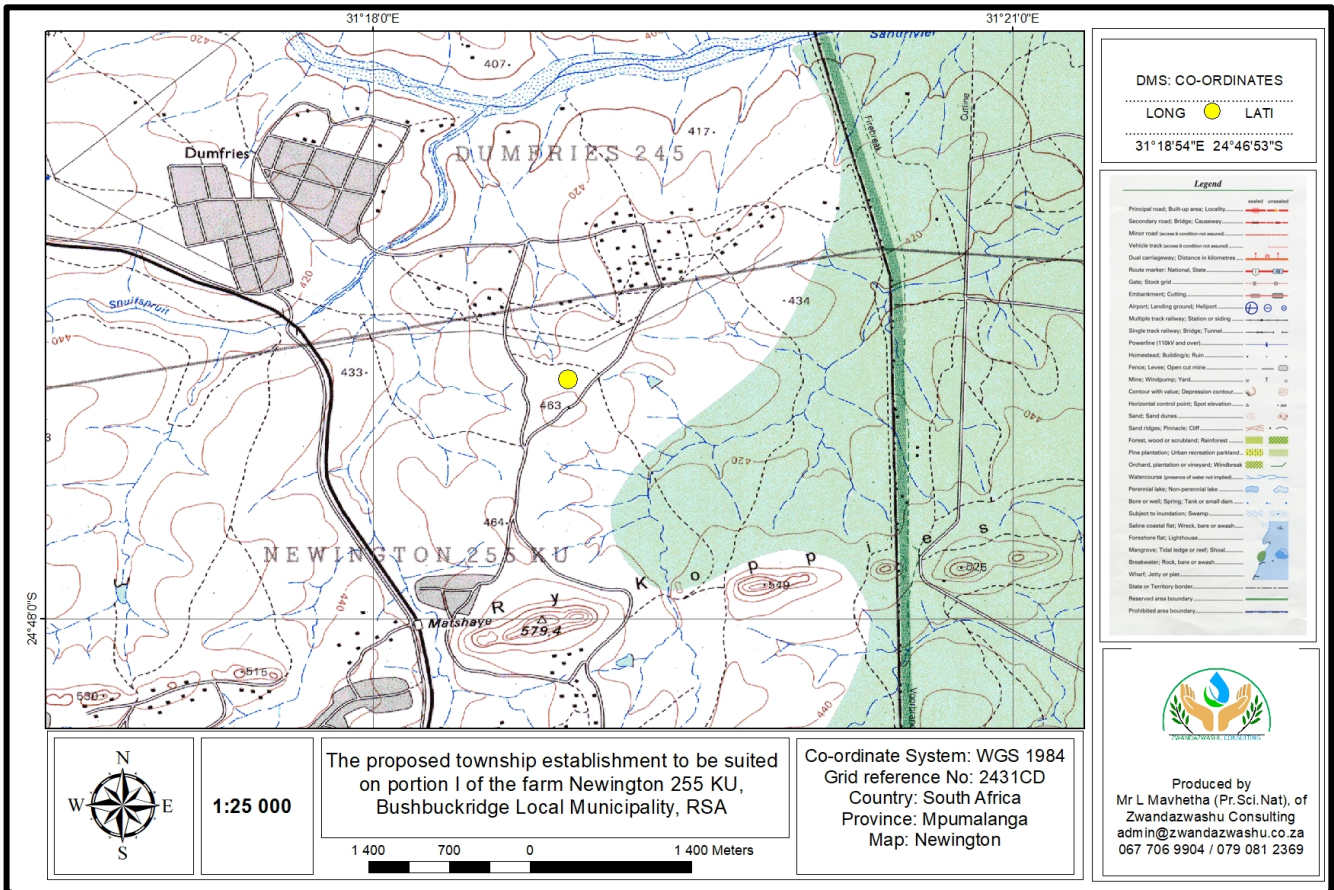


Figure 1: Location of the proposed site (Topographic Map 2431CD)

2.2 Topography

It was noted during site observation survey and actual geotechnical fieldwork procedures that the site topography is slightly steep slope from east to west. This was expected since the engineering geologist conducted geological and topographic studies using ArcGISpro software prior site visit. During the investigation the proposed site was accessible by a four-wheeled drive vehicle as there are few tracks or trails on site.

2.3 Climate

The Dumphries can be characterised as semiarid climate which receive approximately 353mm precipitation annually. The average temperatures in Dumphries ranges from 29°C in January and 22°C is the lowest which occurs in the month of July.

The climatic conditions of the site under investigation play significant role in weathering of rocks through chemical weathering. Thus, climate is the principle player in the development of a soil profile and the weathering of rock. Weinert (1964) demonstrated that chemical decomposition is the predominant mode of rock weathering in areas where the climatic “N-value” is less than 5. In areas where the climatic N-value is between 5 and 10, disintegration is the predominant form of weathering,



although some chemical decomposition of the primary rock minerals still takes place. Where the climatic N-value is greater than 10, secondary minerals do not develop to an appreciable extent and all weathering takes place by mechanical disintegration of the rock.

Weinert's climatic N-value for the study area is less than 5. This implies that rocks are extensively weathered, often to depths of several metres, and decomposition is pronounced.

3. GEOHAZARDS

3.1 Seismic Hazard / Activities

The Seismic-hazard can be described as being the physical effects of an earthquake or earth tremor. Examples of such phenomenon include surface faulting, ground shaking and liquefaction (Kijko A et al, 2004). According to the published (Council for Geosciences) Seismic Hazard Identification Maps of South Africa, Site falls under an area with a 10% probabilistic of $>0.12g$ (peak ground acceleration) being exceeded in a 50 year period. The peak ground acceleration is the maximum acceleration of the ground shaking during an earthquake.

For masonry and concrete structures, a 4 to 5 Hz Spectral Acceleration is assumed. This natural frequency of the structure can give an indication of the spectral part of the earthquake motion time history that has the capacity to introduce energy into the structure. Spectral Acceleration (ARS – acceleration-response spectra) is the movement experienced by the structure during an earthquake / seismic event.

This phenomenon is known as resonance. Resonance is where the frequency of the applied harmonic force is consistent with the natural frequency of a vibrating body. At resonance, the vibrating body will exhibit the maximum amplitude of response displacement leading to extremely high structural distress similar to popular example of the Tacoma Narrows Bridge that was situated in Washington State, near Puget Sound. Therefore, frequencies far away - either lower or higher - from the natural frequency of the structure have little capability of damaging the structure.

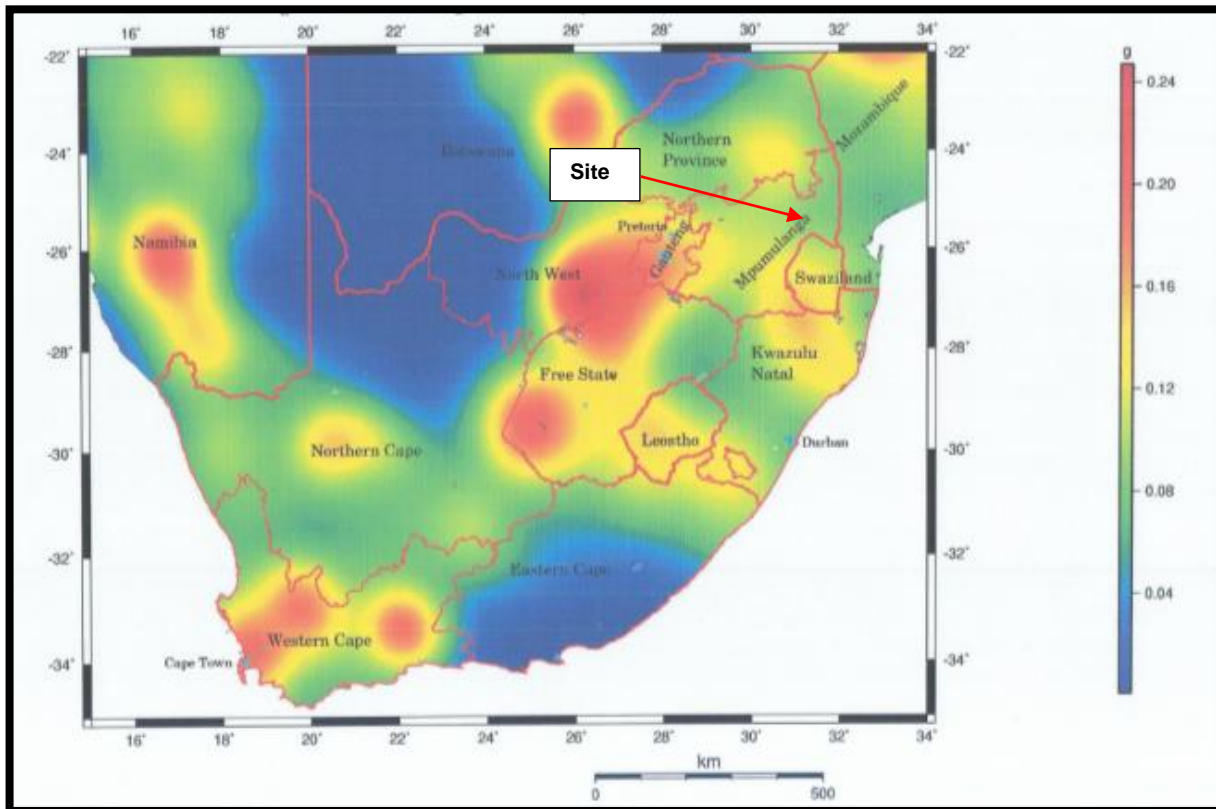


Figure 2: Seismic hazard map of South Africa (I)

Seismic hazard maps of South Africa produced by Kijko (2003), show the site is situated in the area where the peak ground acceleration is greater than 10% probabilistic of exceedance in a 50-year period is approximately 0.12 to 0.20g. This area is a low seismic hazard area and the construction materials to be used (gravel) are in harmony with the naturally occurring site conditions. As a result, no major problems are foreseen in this regard.

Two types of seismic activities occur in South Africa, namely:

- Regions of natural seismic activity (Zone I), and
- Regions of mining-induced and natural seismic activity (Zone II).

In accordance with the seismic hazard zones contained in SANS 10160-4 (2011), the site does not fall within either Zone I or Zone II, as shown in Figure 3.

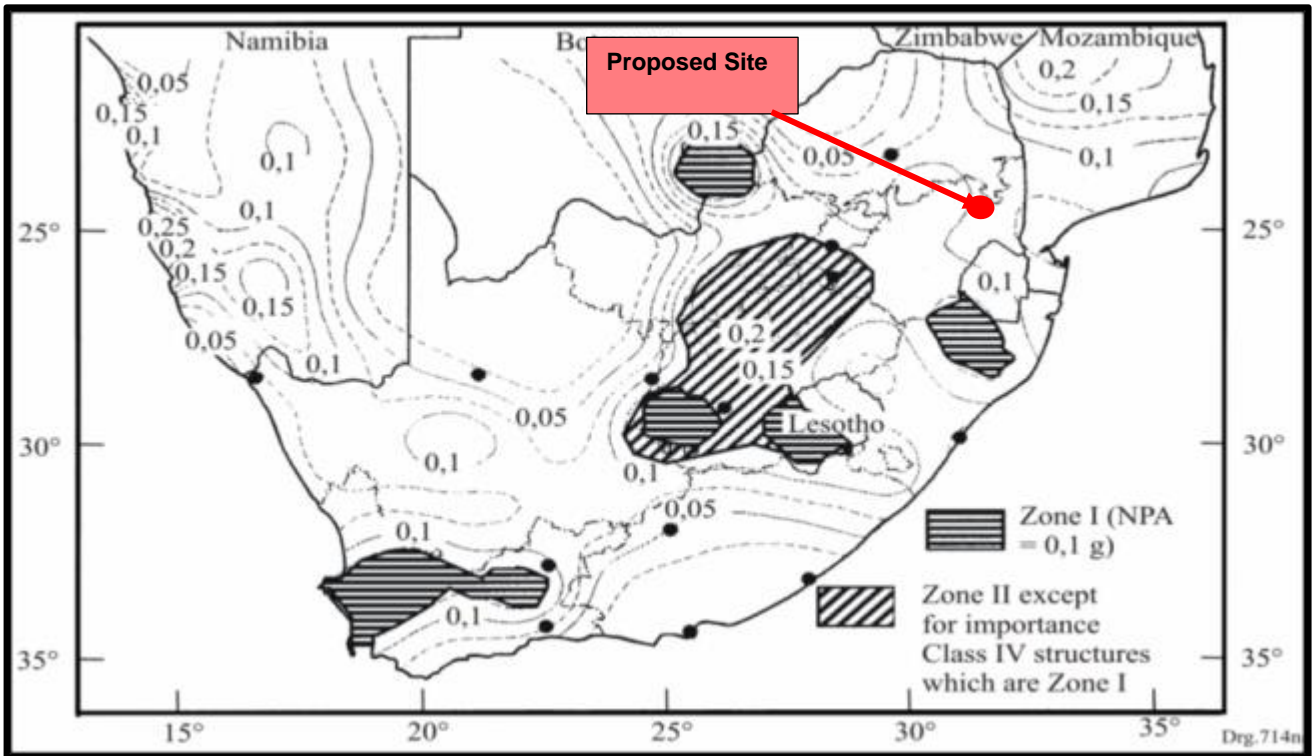


Figure 3: Seismic Hazard Zones of South Africa (SANS 10160-4, 2011)

3.2 Ground Subsidence

Subsidence occurs in areas with large underground cavities typically resulting from large scale shallow to very shallow mining and from dolomite/limestone dissolution. It may also appear where thick deposits of unconsolidated material exist.

Note: No signs of previous subsidence were evident during the site investigation and no underground mining activity has occurred in this area.

3.3 Sinkhole Formation

Similar to subsidence, sinkhole formation happens in areas with very large to extremely large underground cavities resulting from mining poorly designed shallow underground activities. Coal Mines in Mpumalanga Province and Gold Mines in Limpopo Province are typical examples of such calamity. Dissolution of dolomites or limestone over millions of years also lead to cavity formations that might later manifest into sinkhole formation as evidenced very much so in Limpopo and Gauteng Provinces.

According to the research done, there are no records of wide shallow underground mining activities directly below this site. There is no dolomite or limestone underlying the site so the chances of dolomite related sinkhole formation are unlikely. However, the presence of a Granite rock within the site needs to be monitored as it is a carbonate rock.



Note: The available geological maps indicate that the site is not underlain by dolomite.

3.4 Landslides and Mudslides

The probability of landslides and mudslides occurring at this area are rare. This is primarily due to the low relief, relatively slightly steep ($<15^\circ$) gradient of the area, climatic conditions and composition of residual and transported materials in this particular area. Furthermore, the soil on site is relatively compacted and its void ratio doesn't promote infiltration and percolation which are among the primary factors in occurrence of landslide and mudslide.

3.5 Falls and Rockslides

There is no chance of occurrence of rock falls and rockslides due to the low relief and shallow gradient.

3.6 Volcanic Activities

South Africa has seen its last volcanic activity approximately 65 million years ago during the massive historical eruption of the Drakensberg Lava forming the Basaltic Drakensberg Mountain Ranges that we see today. The site indicates no signs of volcanic eruption in the foreseeable future.

4. METHOD OF INVESTIGATION

Based on the "Site Investigation Code of Practice" (SAICE Geotechnical Division, 2010), which provides standards for "acceptable engineering practice", a total of twenty seven (27) test pits were planned for the proposed development.

The method of investigation was based on a near surface investigation, to a maximum depth of 2.5m below existing ground level, for the proposed activity.

The site investigation, which was carried out on the 13th of November 2020, comprised the excavation of test pits in order to profile the subsurface. The layout of the test positions is shown in Figure 5.

4.1 Desk Study

The desk study comprises the review of existing regional, site and surface information. Sources of information include:

- Topographic maps, geological data such as lithology of nearby rock outcrops, landforms and erosion patterns;
- Existing geotechnical reports prepared for areas in close proximity to the site;



- Data on seismic aspects, such as ground motion and liquefaction potential.

4.2 Test Pits

Forty Six (46) test pits were excavated by means of Tractor loader Backhoe (TLB) in order to obtain information on the subsurface soil. Each test pit which was deemed safe to enter was marked, photographed and profiled by a field engineering geologist in accordance with the “Guidelines for Soil and Rock Logging in South Africa”, 2nd Impression 2002, sampled as necessary and then loosely backfilled. Test pit soil profiles are attached in Appendix C.

A summary of information obtained from the test pits is shown in Table 1 and test pit position in figure 4.

Table 1: Summary of test pit information

TP ID.	Handheld GPS Coordinates			Depth (m)			Comment
	Longitude (E)	Latitude (S)	Altitude (m)	Topsoil	Residual Soil (Granite)	Bedrock (granitic)	
TP1	31°18'40.4"E	24°47'11.2"S	434m	0.4	1.6	2.3	Refusal on granite bedrock
TP2	31°18'34.91"E	24°47'9.19"S	437m	0.47	1.3	1.6	Refusal on granite bedrock
TP3	31°18'33.61"E	24°47'5.73"S	430m	0.3	0.7	1.37	Refusal on granite bedrock
TP4	31°18'36.88"E	24°47'3.96"S	431m	0.4	0.6	0.8	Refusal on granite bedrock
TP5	31°18'41.65"E	24°47'6.13"S	436m	0.4	1	1.7	Refusal on granite bedrock
TP6	31°18'41.69"E	24°47'9.04"S	440m	0.55	1.2	1.7	Refusal on granite bedrock
TP7	31°18'45.49"E	24°47'6.27"S	428m	0.45	1.2	1.9	Refusal on granite bedrock
TP8	31°18'46.87"E	24°47'4.46"S	440m	0.3	0.9	1.7	Refusal on granite bedrock
TP9	31°18'39.73"E	24°47'0.89"S	437m	0.3	0.7	1.3	Refusal on granite



							bedrock
TP10	31°18'41.88"E	24°46'58.75"S	435m	0.35	1	1.5	Refusal on granite bedrock
TP11	31°18'46.85"E	24°46'55.7"S	442m	0.4	1.4	2.1	Refusal on granite bedrock
TP12	31°18'51.02"E	24°46'51.98"S	436m	0.6	1.5	2.3	Refusal on granite bedrock
TP13	31°18'56.7"E	24°46'45.52"S	438m	0.55	1.4	2.3	Refusal on granite bedrock
TP14	31°18'59.40"E	24°46'45"S	439m	0.42	1.25	2.2	Refusal on granite bedrock
TP15	31°19'0.43"E	24°46'50.05"S	444m	0.54	1.2	1.8	Refusal on granite bedrock
TP16	31°18'54.29"E	24°46'54.01"S	448m	0.54	1.5	2	Refusal on granite bedrock
TP17	31°18'51.59"E	24°46'57.58"S	451m	0.35	1.95	2,5	Refusal on granite bedrock
TP18	31°18'48.97"E	24°47'2.26"S	446m	0.6	1.3	1.8	Refusal on granite bedrock
TP19	31°19'7.23"E	24°46'44.46"S	432m	0.4	1	1.9	Refusal on granite bedrock
TP20	31°19'4.42"E	24°46'41.47"S	430m	0.38	1.3	1.8	Refusal on granite bedrock
TP21	31°19'7.70"E	24°46'39.73"S	430m	0.37	1.1	1.8	Refusal on granite bedrock
TP22	31°18'8.86"E	24°46'44.12"S	440m	0.6	1.6	2.2	Refusal on granite bedrock
TP23	31°19'4.44"E	24°46'47.86"S	434m	0.35	1.9	2.2	Refusal on granite bedrock
TP24	31°18'57.95"E	24°46'55.85"S	436m	0.5	1.8	2.4	Refusal on granite bedrock
TP25	31°18'53.88"E	24°46'59.85"S	430m	0.42	1.7	2.5	Refusal on granite bedrock
TP26	31°18'46.45"E	24°46'59.86"S	445m	0.45	1.85	2.1	Refusal on granite bedrock



TP1A	31°18'30.00"E	24°47'03.30"S	434m	0.36	0.6	1.1	Refusal on granite bedrock
TP2A	31°18'26.53"E	24°47'00.77"S	437m	0.48	2.2	2.3	Refusal on granite bedrock
TP3A	31°18'29.15"E	24°46'58.52"S	430m	0.37	1.3	1.4	Refusal on granite bedrock
TP4A	31°18'31.91"E	24°47'01.20"S	431m	0.4	0.6	0.8	Refusal on granite bedrock
TP5A	31°18'37.52"E	24°46'57.87"S	436m	0.55	2.8	-	Sandy gravel
TP6A	31°18'33.51"E	24°46'56.41"S	440m	0.5	0.9	2.2	Refusal on granite bedrock
TP7A	31°18'38.35"E	24°46'50.71"S	428m	0.45	3	-	Sandy gravel
TP8A	31°18'41.53"E	24°46'53.39"S	440m	0.4	2.8	-	Sandy gravel
TP9A	31°18'46.14"E	24°46'49.12"S	437m	0.38	2.5	-	Sandy gravel
TP10A	31°18'42.31"E	24°46'45.93"S	435m	0.3	2.55	-	Sandy gravel
TP11A	31°18'37.24"E	24°46'42.92"S	442m	0.43	2.6	-	Sandy gravel
TP12A	31°18'31.21"E	24°46'53.88"S	436m	0.6	1.8	2	Refusal on granite bedrock
TP13A	31°18'38.59"E	24°46'47.68"S	438m	0.58	1.7	1.8	Refusal on granite bedrock
TP14A	31°18'33.59"E	24°46'45.89"S	439m	0.4	1.2	1.3	Refusal on granite bedrock
TP15A	31°18'34.29"E	24°46'50.50"S	444m	0.38	1.5	1.6	Refusal on granite bedrock
TP16A	31°18'29.71"E	24°46'48.99"S	448m	0.45	1.6	1.7	Refusal on granite bedrock
TP17A	31°18'25.56"E	24°46'52.24"S	451m	0.4	1.83	1.9	Refusal on granite bedrock
TP18A	31°18'22.17"E	24°46'53.91"S	446m	0.3	1.1	1.2	Refusal on granite bedrock
TP19A	31°18'27.14"E	24°46'55.37"S	432m	0.35	1.5	1.7	Refusal on granite bedrock



TP20A	31°18'21.98"E	24°46'56.54"S	430m	0.48	1.98	2.04	Refusal on granite bedrock
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The position of the test pits are indicated on the layout below.

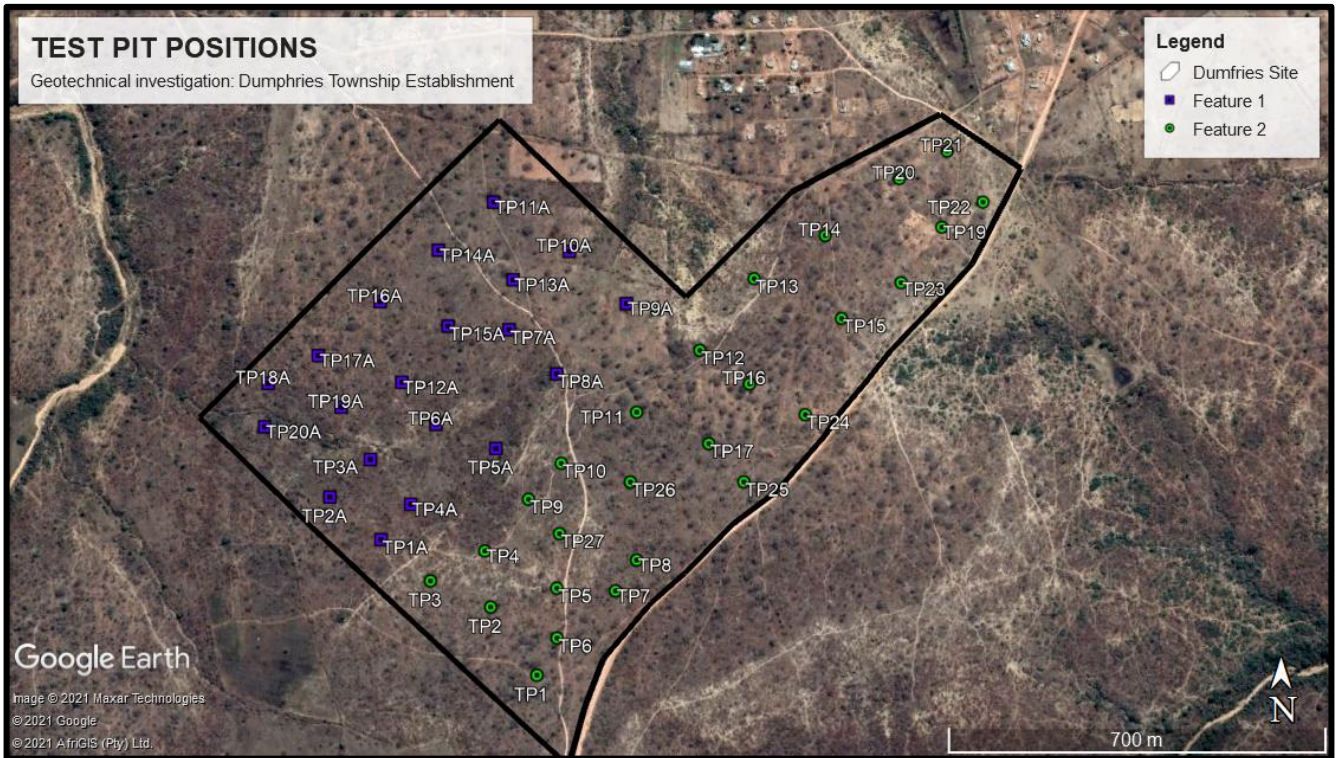


Figure 4: Test pit position

4.3 Laboratory Tests

The field work indicated a general homogeneity of the subsurface soils comprising of Slightly moist, light brown, Coarse grained, **gravelly SAND**, Slightly weathered granite bedrock. Representative disturbed subsoil samples retrieved from the inspection pits during the investigation were taken to a commercial laboratory for testing. These tests aid in assessing the behavior of soils due to moisture changes particularly below foundations. The following tests were conducted on soil samples taken during the field work phase by a suitable SANAS accredited soils laboratory (Civilab, Johannesburg (Booyens): Gauteng Province) and (RoadLab, Germiston, JHB, and Gauteng Province) respectively:

Standard foundation indicator tests were conducted on disturbed soil samples in order to determine its composition, to evaluate the heave and compressibility potential of these soils, and to calculate the maximum heave and/or differential settlement that can be expected. The following tests were conducted:

- 33 Atterberg Limits (plastic limit, liquid limit and plasticity index);
- 33 Grading analysis and;
- 5 MOD and 5 CBR,



- 2 pH and 2 Conductivity

The laboratory tests were conducted in order to assist with the classification, description, and delineation of homogenous zones. The results of the foundation indicator, MOD and CBR tests are presented in Appendix B and are summarized in Table 2 and Table 3 respectively. The samples were taken from the test pit position denoted in the same manner.

Topsoil Material – Topsoil layer was observed in all of the trial pits. The material didn't show road bearing capacity. There was no sample taken from this layer. The layer has average thickness of 0.4m in the range 0 to 0.4m below ground level. It is characterised by non-cohesive materials typically described as "Dry to Slightly moist, greyish, intact, Dense, **Sandy SILT.**"

Residual soils – Twelve bulk samples were collected from the slightly moist, light brown, Coarse grained, **gravelly SAND**. The granite bedrock was slightly weathered and fractured. The bedrock was friable and excavatable as gravel size fragments. The granite grades with depth from slightly weathered medium hard rock to consolidated high strength **granite bedrock**. Homogeneity of material underlying the site was observed hence a choice of twelve bulk representative samples. The samples were found to be non-plastic. The PI along with the clay content indicated that the samples exhibit low potential expansiveness. The sample indicated CBR of 38 at 95% MOD AASHTO with a grading modulus of 2.0 for TP2, a CBR of 72 at 95% MOD AASHTO with a grading modulus of 1.9 for TP10. Based on the grading modulus, Atterberg limits and CBR the area under investigation were classified as G5 material.

PH and Conductivity – pH measurements conducted indicated that the pH of the area is 6.7 for TP02 at a depth of 0.47-1.2m and 6 for TP17 at depth of 0.35-1.5m. This pH of the site indicates more of acidic to neutral. Acidic as it ranges from 6 to 6.7. Conductivity measurements indicated that the conductivity of the area is 0.017 Ms/m for TP02 at a depth of 0.47-1.2m, 0.007 Ms/m for TP17 at depth of 0.35-1.5m. The area can be classified as Non-corrosive (NC). Having said that, does not mean corrosive materials (pipelines) installation must not include measures against corrosion.

**Table 2: Summary of the foundation test results**

Sample No.	HRB (AASSTO)	Depth (m)	Atterberg Limit			GM	Grading analysis (%)				Potential expansiveness
			LL %	LS %	PI %		Clay	Silt	Sand	Gravel	
TP01	A-1-b(0)	0.4 – 1.6	-	1	NP	1.53	4	6	78	12	LOW
TP01	A-1-b(0)	1.6 – 2.3	-	0.5	NP	2.17	1	2	56	41	LOW
TP02	A-2-4(0)	0.47 – 1.2	23	3	7	2.02	1	5	57	37	LOW
TP03	A-1-b(0)	0.3 – 0.7	-	-	NP	2.16	1	1	58	40	LOW
TP05	A-2-4(0)	0.4 – 1	27	4.5	10	2.24	1	3	46	50	LOW
TP07	A-2-6(0)	0.45 – 1.2	26	5.0	14	2.27	2	2	41	55	LOW
TP10	A-1-b(0)	0.35 – 1	-	-	NP	1.90	1	5	61	33	LOW
TP12	A-1-b(0)	0.6 – 1.5	-	-	NP	1.55	1	6	86	7	LOW
TP14	A-1-b(0)	0.42 – 1.25	-	1	SP	2.04	1	5	51	43	LOW



TP16	A-1-b(0)	0.54 – 1.2	-	-	NP	1.58	5	5	68	22	LOW
TP17	A-1-b(0)	0.35– 1.5	-	-	NP	1.64	3	2	83	12	LOW
TP19	A-1-b(0)	0.4-1.0	-	-	NP	1.73	4	7	60	29	LOW
TP1A	A-2-6(1)	0.6-1.1	31	11	22	1.56	17	7	53.9	22	LOW
TP2A	A-1-b(0)	0.48-2.2	-	-	NP	2.13	3.7	5.7	41.2	49.4	LOW
TP3A	A-1-b(0)	0.37-1.3	-	-	NP	2.13	2.1	3.1	57.4	37.4	LOW
TP5A	A-1-a(0)	0.9-2.2	20	1.5	3	2.43	1.8	2.6	31.5	64.1	LOW
TP5B	A-6(2)	0.5-0.9	37	7	14	1.05	28.3	12.1	48.6	11.0	LOW
TP6A	A-1-a(0)	0.48-1.8	-	-	NP	2.15	5.4	5.4	38.2	51.1	LOW
TP7A	A-1-b(0)	0.45-3	-	-	NP	1.85	7.3	5.5	58.1	29.1	LOW
TP8A	A-1-b(0)	0.4-2.7	-	-	NP	1.76	6.1	6.4	60.8	26.7	LOW



TP9A	A-1-b(0)	0.8-2.5	-	-	NP	1.94	5.7	5.4	52.2	36.7	LOW
TP10A	A-1-b(0)	0.3-2.5	-	-	NP	1.96	4.1	6.4	50.9	38.6	LOW
TP11A	A-1-b(0)	0.43-2.6	-	-	NP	1.89	5.4	6.1	56.9	31.6	LOW
TP12A	A-1-b(0)	0.6-1.8	-	-	NP	2.06	3.3	5.3	48	43.4	LOW
TP13A	A-1-b(0)	0.58-1.7	-	-	NP	2.17	3.4	4.2	45.7	46.7	LOW
TP14A	A-1-b(0)	0.4-1.2	-	-	NP	2.04	3.9	7.0	42	47.1	LOW
TP15A	A-1-b(0)	0.38-1.5	-	-	NP	1.91	4.2	5.8	58.9	31	LOW
TP16A	A-1-b(0)	0.45-1.6	-	-	NP	2.08	3.8	4.7	47.6	44	LOW
TP17A	A-1-b(0)	0.4-1.83	-	-	NP	2.06	5.3	4.6	48.4	41.6	LOW
TP18A	A-1-b(0)	0.3-1.1	-	-	NP	1.83	5.3	7	56.7	31	LOW
TP19A	A-1-b(0)	0.35-1.5	-	-	NP	2.05	5.6	5	46.2	43.1	LOW



TP20A	A-1-b(0)	0.48-1.98	-	-	NP	2.01	5.4	5.7	47.7	41.2	LOW
-------	----------	-----------	---	---	----	------	-----	-----	------	------	-----

LL: Liquid Limit **PI:** Plasticity Index **LS:** Linear Shrinkage **GM:** Grading Modulus **NP:** Non-Plastic

Table 3: Summary of the CBR test results

Sample No.	HRB (AASTO)	Depth (m)	CBR @						GM	Max. Swell (%)	OMC (%)	Max Dry Density (kg/m ³)	COLTO Classification
			90 %	93%	95%	97%	98%	100%					
TP02	A-2-4(0)	0.47-1.2	22	31	38	48	54	68	2.0	0.2	6.6	2077	G5
TP10	A-1-b(0)	0.35–1.0	43	59	72	89	99	122	1.9	0.1	6.2	2114	G5
TP17	A-1-b(0)	0.35-1.5	1	1	1	1	1	1	1.6	0.1	6.3	2040	-
TP2A	A-1-b(0)	0.48-2.2	13	20	26	35	41	55	2.13	0.1	5.5	2024	G6
TP5A	A-1-a(0)	0.9-2.2	11	15	21	29	37	56	2.43	0.09	4.8	2081	G7
TP7A	A-1-b(0)	0.45-3	15	18	24	35	42	55	1.87	0.07	5.2	2037	G7
TP12A	A-1-b(0)	0.6-1.8	10	15	21	25	29	36	2.06	0.08	4.3	1995	G7
TP19A	A-1-b(0)	0.35-1.5	11	19	28	41	50	73	2.05	0.08	4.8	2103	G6

GM:

Grading

PI: Plasticity Index Modulus

OMC: Optimum Moisture Content **CBR:** California Bearing Ratio



5. REGIONAL & SITE GEOLOGY

5.1 Regional Geology

The site under investigation falls under the cunning moor tonalite of the archaean granitic basement which is situated adjacent to the Mpuluzi Granite and Barberton greenstone belt. It must be noted that outcrops which were observed during site geological examination reveal the phaneritic texture granatoid rocks which are predominately composed of felsic minerals such as quartz, plagioclase feldspars and mafic (amphiboles and pyroxene) accessory minerals. Based on the physical properties of the rock samples and geological maps review of the site; the lithology of the site is coarse grained granite. The site doesn't have many exposed outcrops, majority of the site overlaid by thick strata of sandy silt at the top and medium to coarse gravel before to the base of the granitic bedrock. The geological map in figure 5 indicates the geological setting of the site and its surrounding.

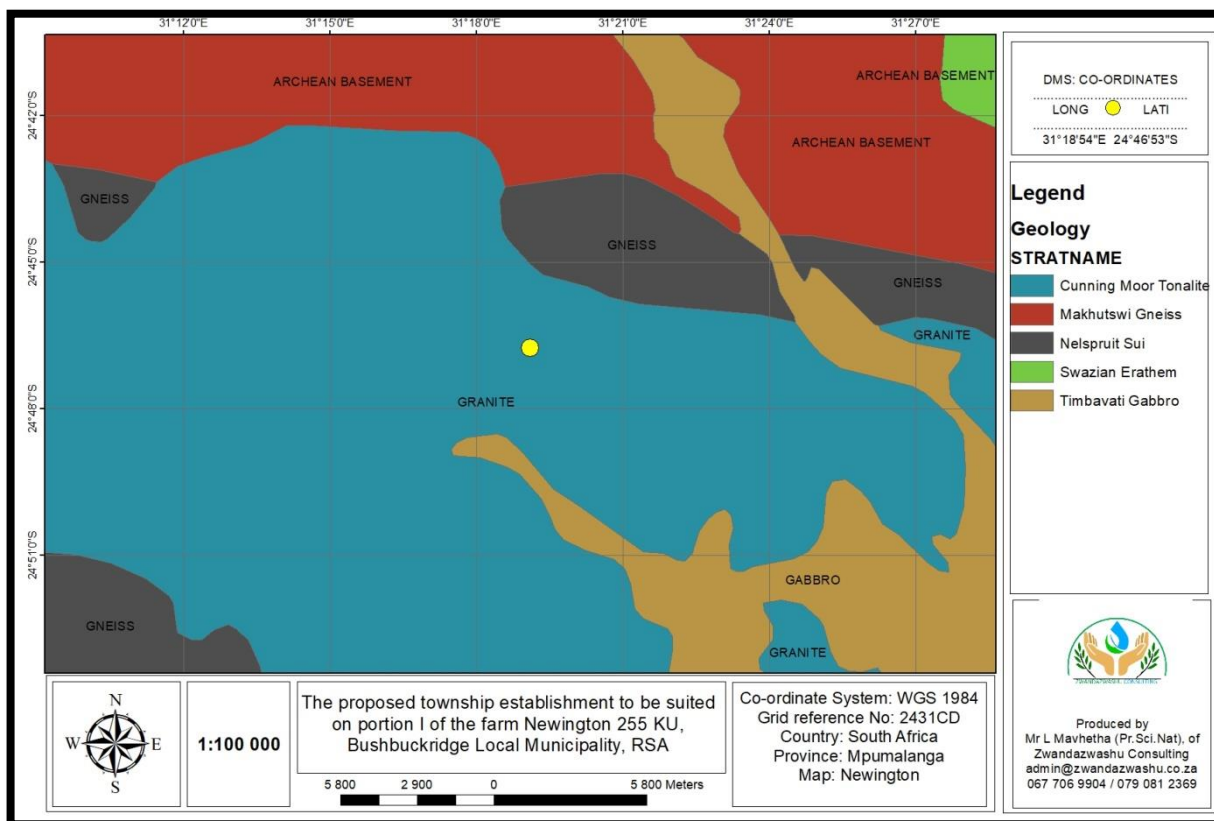


Figure 5: Geological setting of the site

5.2 Site Geology

From observation, the following generalised soil and rock profiles were encountered on site.



5.2.1 Topsoil

The topsoil is characterised by an upper stratum of sandy silt which have an average thickness of 0.4m in the range 0 to 0.4m below ground level. It is characterised by non-cohesive materials typically described as “Dry to Slightly moist, greyish, intact, Dense, **Sandy SILT.**”

5.2.2 Residual soil

Residual soil was encountered in all test pits with an average thickness of 1.3m in the range 0.7 to 1.95m below ground level.

These soils originate from the in-situ weathering of the granite parent rock of Cunning Moor Tonalite stratigraphic unit. This stratum is typically described as “Slightly moist, light brown, Coarse grained, **gravelly SAND.**”

5.2.3 Granite Bedrock

The granite parent rock of tonalite type underlies the residual soil and was encountered in all test pits at average depth 1.9m.

The granite bedrock was slightly weathered and fractured. The bedrock was friable and excavatable as gravel size fragments. The granite grades with depth from slightly weathered medium hard rock to consolidated high strength **granite bedrock.**

6. HYDROGEOLOGY

6.1 Seepage and Groundwater

Natural ground water seepage was encountered at an average of 2.1m onsite at an area that is classified as C1 in terms of soil site designation as shown in figure 6, which can be regarded as a wetland. However, in the area that area covered by soil site designation of R and C the no water seepage encountered any and there is no indication of temporary perched water tables in the soil profile, not even at the contact between soil and bedrock. It is therefore expected that if temporary perched water was to at the site, it would occur at bedrock level and only after unusually prolonged and substantial rain. Groundwater seepage is not expected to be problematic at shallow depths on this site.

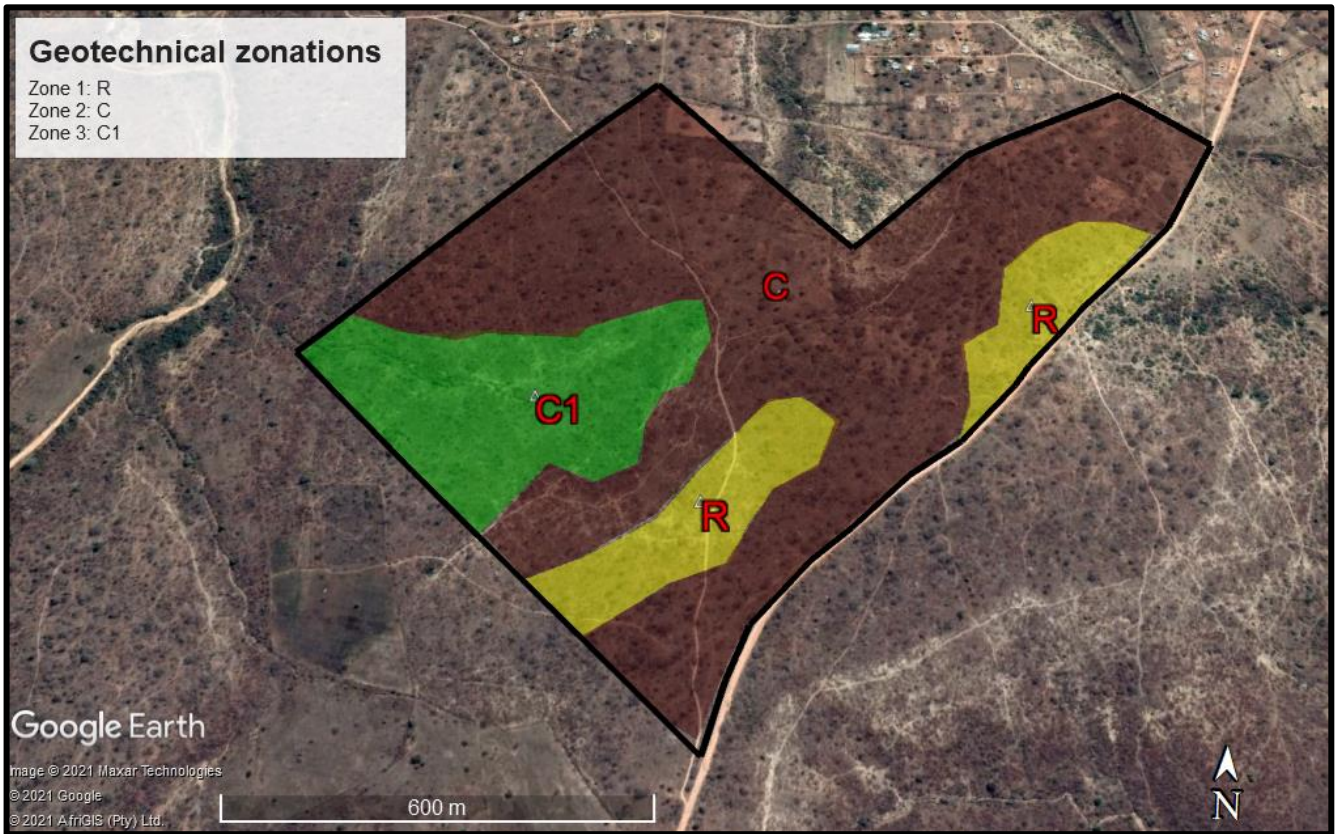


Figure 6: Water seepage map

7. GEOTECHNICAL EVALUATION

This report focuses on the geotechnical site investigation aimed at determining various geotechnical properties of the near surface soil horizons in accordance with SAICE Code of Practice, SANS guidelines and NHBRC guidelines and the GFSH-2 document. Table 4 gives the basis of the soil site classification that was applied during the investigation and Table 5 gives the geotechnical classification for urban development.

Table 4: Residential site class designations

TYPICAL FOUNDING MATERIAL	CHARACTER OF FOUNDING MATERIAL	EXPECTED RANGE OF TOTAL SOIL MOVEMENTS (mm)	ASSUMED DIFFERENTIAL MOVEMENT (%OF TOTAL)	SITE CLASS
Rock (excluding mud rocks which may exhibit swelling to some depth)	STABLE	NEGLIGIBLE	-	R



Fine grained soils with moderate to very high plasticity (clays, silty clays, clayey silts and sandy clays)	EXPANSIVE SOILS	<7,5	50%	H
		7,5-15	50%	H1
		15-30	50%	H2
		>30	50%	H3
Silty sands, sands, sandy and gravelly soils	COMPRESSIBLE AND POTENTIALLY COLLAPSIBLE SOILS	<5,0	75%	C
		5,0-10	75%	C1
		>10	75%	C2
Fine grained soils (clayey silts and clayey sands of low plasticity), sands, sandy and gravelly soils	COMPRESSIBLE SOIL	<10	50%	S
		10-20	50%	S1
		>20	50%	S2
Contaminated soils, Controlled fill, Dolomitic areas, Landslip Land fill, Marshy areas Mine waste fill Mining subsidence Reclaimed areas Very soft silt/silty clays Uncontrolled fill	VARIABLE	VARIABLE		P

Table 5: Geotechnical classification for urban development (GFSH-2 Document)

Geotechnical Sub-Area	Definition
1	Areas recommended or favorable for development
2	Areas where development can be considered with certain precautionary measures.
3	Areas that are not recommended for development

Other related engineering geological characteristics such as collapse settlement, compressibility, slope stability groundwater etc. were evaluated. The geotechnical properties relevant to the development are discussed below.



7.1 Expansive soils

Active/expansive soils are defined as fine grained soils (generally with high clay content) that change in volume in response to the change in moisture content. These soils may increase in volume (heave/swell) upon wetting and decrease in volume (shrink) upon drying out. These soils are classified as (H) according to the SAICE site classes. Depending on the severity of the predicted movement, expansive soils can be classified as H, H1, H2 or H3 (Table 4).

The site is predominately underlain by Granite fragments > silt > with low content of clay. The laboratory results of all the samples analyzed exhibit a low potential expansiveness. Therefore, the site is not classified as class H according to the GFSH-2 classification.

7.2 Collapsible soil

Collapsible soils are defined as soils that have a potential for collapse and are commonly open textured with a high void ratio (Brink, 1985). These soils are typically silty sands, sands, sandy and gravelly soils commonly found in colluvial and aeolian sands. Soils which exhibit potentially collapsible characteristics are classified with the soil site class 'C' according to the SAICE site classification system (Table 4).

The soils encountered on the site typically comprise of granite fragments and silty sand with no visual open-textured structures such as voids and pinholes which indicate collapse potential. Due to the crumbly nature of the soils on site, undisturbed soil samples could not be retrieved for collapse potential testing. From the site observations it is anticipated that the site will exhibit low collapse potential. Therefore, the **site is classified as site class C/C1** according to the GFSH-2 classification.

7.3 Compressible soils

Compressible soils are soils in which the bulk volume of the soil may gradually decrease with time when subjected to an applied load. These soils typically comprise fine grained soils such as clay, clayey sand and clayey silt with low plasticity, gravelly and sandy soil. According to the SAICE soil site class these soils are denoted as class 'S' and may vary (S, S1, S2) depending on the severity of the bulk volume change (Table 4).

The site is generally underlain by non-cohesive soils with low plasticity index. The laboratory results indicate that the samples have a low clay content and high sand content.

7.4 Soil site classification

A review of the test pit data indicates that the site is generally underlined by granite bedrocks. The laboratory tests indicated that material underlying the site exhibits low potential expansiveness. The development potential has been broadly classified in terms of a Geotechnical Sub-Area based on field observations/investigation (geological, hydrogeological, and geomorphological), and laboratory



soil testing of soil samples. From the above discussion the site is classified into main soil area namely compressible and potential collapsible soils: According to AASHTO and COLTO the soil samples were classified as A-1-b(0) and G5 respectively. **The foundation design options as per SANS10400 H- NHBRC soil symbol is “R/C/C1”.** The recommended Foundation types in accordance with SANS 10400H- **Normal Strip Foundation / Reinforced Deep Strip Foundation.**

The in-situ soils and slightly weathered Granite bedrock were excavated to an average depth of 1.9m below ground level.

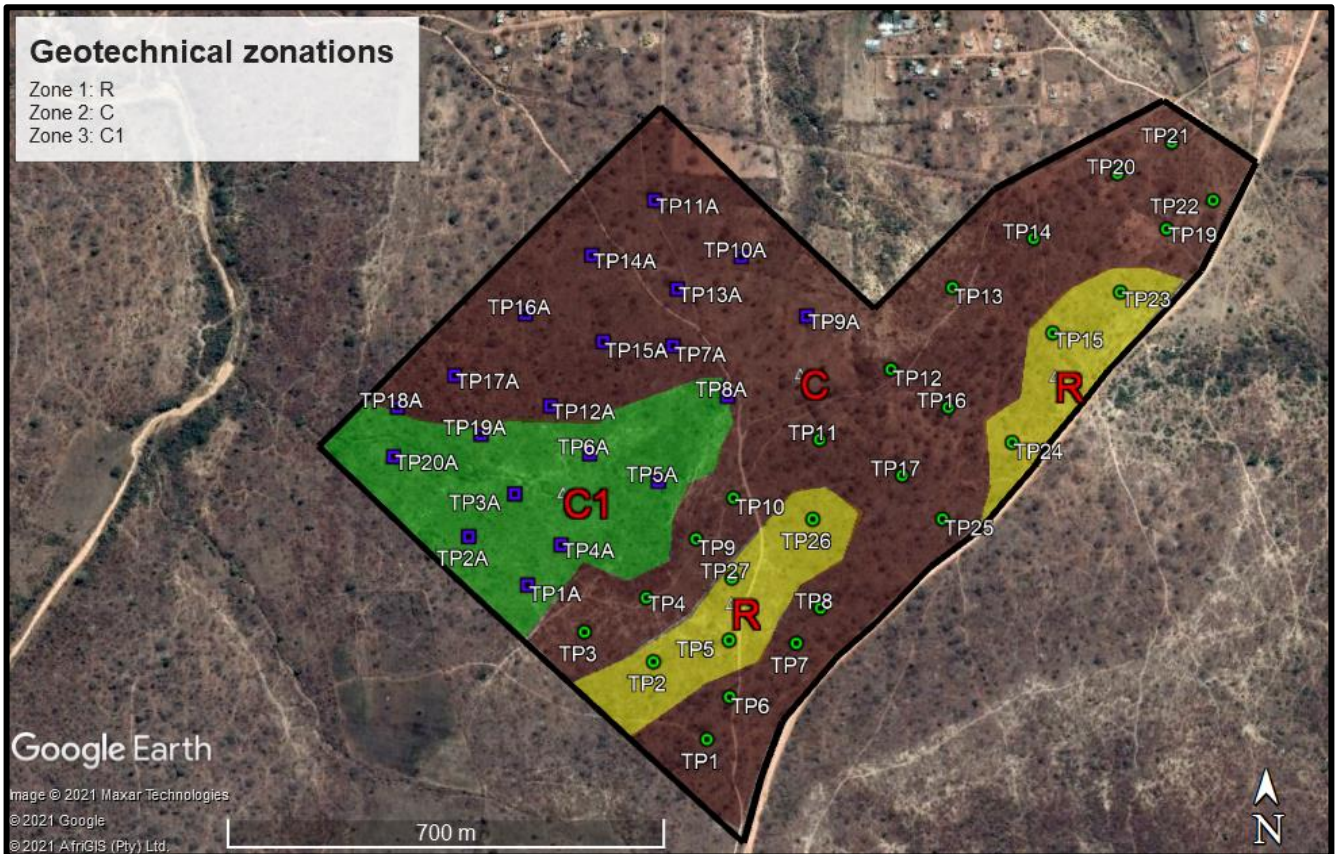


Figure 7: Geotechnical zone/ soil class designation

Based on the test pits excavations, it is anticipated that site should classify as “soft excavation” to an average depth of 1.9m, in accordance with SANS 1200 DA classification using similar plant as employed during this investigation. This means it can easily be removed by a tractor loader backhoe (TLB) of flywheel power >0.10 kW per mm of tined bucket width.

Allowance should be made for “intermediate to hard excavation” where deeper excavations are required from a depth 1 m where Granite bedrock starts.



7.5 Construction Monitoring

During the construction phase, it is highly recommended that qualified personnel should regularly inspect and monitor, to track and record deviations in the actual foundation conditions from those predicted as reported in this geotechnical site investigation report

8. RECOMMENDATIONS

8.1 Foundations

It is important to note that foundation recommendations are subject to confirmation of laboratory test results. Based on site conditions and evaluation described in section 5, 6 & 7 the following foundation types are provisionally recommended.

8.1.1 Foundations on residual soils

Residual soil and its parent rock were encountered at various, uneven depths ranging from 0.7 to 1.95m below the ground level.

Therefore, the recommended foundation type is a **reinforced strip foundation founded on a G5/G6 engineered soil mattress**. The in-situ material can be utilised for founding material as there are of G5 material. Reinforcement should be designed by a competent person. The following construction procedures apply.

- All topsoil to be stripped to spoil;
- Foundation trenches for 500mm wide strip footing to be over-excavated to 1.0m wide by 1.6m deep below existing ground level;
- Excavation to be backfill with G6 quality material to a depth of 0.6m existing ground level;
- G6 material to be compacted in 150mm thick layers to 93% Mod AASHTO density at -1% to +2% OMC;
- Strip footings 500mm wide and adequately reinforced should be constructed at a depth of 0.6m;
- The allowable bearing capacity should be limited to 150kPa on the engineered soil mattress;
- Articulation joints at some internal doors and all external doors;
- Light reinforcement in masonry;
- Good site drainage requirements.



8.1.2 Foundations on weathered Granite

The slightly weathered granite hard rock is encountered at a depth of 0.8m below existing ground level. The recommended foundation type is a **normal strip foundation** onto the medium hard rock granite. The following construction procedures apply:

- All topsoil to be stripped to spoil;
- Foundation excavation to the moderately weathered, highly fractured, medium hard rock at an average depth of 1.9 m below existing ground level;
- The excavation onto the weathered Granite to be hand cleaned and all loose material to be removed;
- A concrete blinding to be cast to onto cleaned rock surface prior to casting foundations;
- The allowable bearing capacity should be limited to 300kPa on the weathered Granite bedrock.

9. CONCLUSIONS

From the above discussion, the following conclusions may be drawn:

- The area investigated is underlain by top soils of sand, including residual soils derived from the in-situ weathering of Granite.
- Residual soil from Granite is well developed and was encountered in the entire site an average depth of 1.9m below existing ground level.
- The excavation on site is likely to classify as “soft” to an average depth of 1.9m below existing ground level. Below this, “intermediate to hard” excavation is expected. This due to the underlining granite bedrock
- Foundation recommendations include **reinforced deep strip foundations** on an engineering soil mattress for residual soils and **Normal Strip Foundation** on medium hard rock Granite

10. REPORT PROVISIONS

This investigation is aimed at providing the engineers with an indication of the prevailing geological and geotechnical conditions in the study area, with reference to the proposed township establishment to be situated on portion 1 of the farm Newington 255 KU, Mpumalanga province of South Africa.

While every effort has been made during the fieldwork investigation to identify the various soil horizons, their problems and distribution, it is impossible to guarantee that isolated zones of varying



material have not been missed. The investigation was, however, thorough and conditions are not expected to vary a great deal from that described in this report.

The engineers are, nevertheless, strongly urged to inspect all excavations to assure themselves that conditions are not at variance with those described in this report.

Please note:

- Test pits were backfilled after the field investigation but were not re-compacted.
- Some test pits positions occur within the footprints of proposed structures.
- The recommendations provided in this report are provisional and a final interpretive geotechnical report will be prepared when these become available.



11. REPORT SIGNATURE

Geotechnical site investigation report prepared by;

Zwandazwashu Consulting (Pty) Ltd

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817 16th Road, Randjespark

Midrand

1685

Cell: 079 081 2369/ 067 706 9904

Compiled by: Neduvhuledza Nduvho (Cand.Nat.Sci) SACNAPS Registration No: 120301

Reviewed by: Mavhetha Lavhelesani (GSSA Member) Registration No: 970200

(Pr.Nat.Sci) SACNAPS Registration No: 126057

Signature of Mr. Mavhetha Lavhelesani 



12. REFERENCES

- SAICE (1995). Code of Practise for Foundations and Superstructures for Single Storey Residential buildings of Masonry Construction. First Edition. The Joint Structural Division, Johannesburg. ISBN 0-620-19317-4.
- Jennings, J E B, Brink, A B a Williams, A B, Revised Guide to Soil Profiling for civil Engineering Purposes in Southern Africa. The Civil Engineer in S A, P 3-12 January 1973.
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- SABS-0160 (1989). The general procedures and loadings to be adopted in the design of building. First Revision. ISBN 0-626-09815-7.
- South African Geological data: Geology.shp
- Topographical Map data: 2431CD.shp

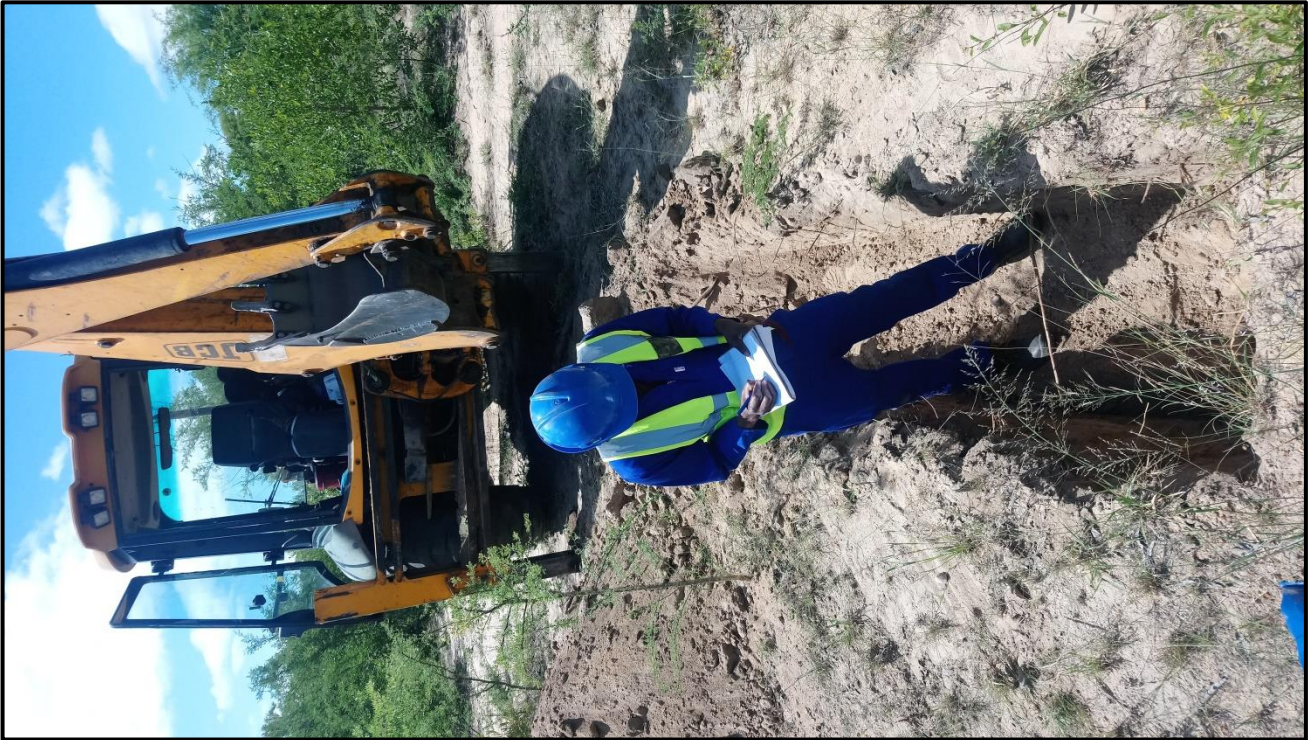


13. APPENDIX A: SITE PICTURES















14. APPENDIX B: LABORATORY RESULTS



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Germiston, JHB, 1400

Ref- 92/NKA001-02/0001/21

Date - 2021/05/24

Nkanivo Development Consultants

P.O 11948

Silver Lakes

Pretoria

Attention: Mr. L Mavhetha

Re: Dumphries Township Establishment – Foundation Indicator Test Results

Herewith please find attached the test results for the above-mentioned project as tested by Roadlab Laboratories.

Thank you

Kind Regards

Mr N Herbst / Mr R Potgieter

Technical Signatory / Manager



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Ref - 92/NKA001-02/0001/21 Job no- RG 16732 Date- 2021/05/24

Nkanivo Development Consultants
P.O.Box 11948
Silver Lakes
Pretoria

ATTENTION: Mr. L Mavtetha

Test Report : DUMPHRIES TOWNSHIP ESTABLISHMENT - pH & CONDUCTIVITY TEST RESULTS

Clients Marking: None Date Sampled: 2021/05/04
Sample Number: S/8450 - S/8455 Date Received: 2021/05/04
Sample delivered to: Roadlab

Table with 6 columns: Sample Number, Layer / Road, Temperature (°C) : Conductivity, Conductivity (ms/m), Temperature (°C) : pH, pH Value. Contains two rows of data for samples S/8450 and S/8455.

PAGE 1/1

Kind Regards

Mr N Herbst / Mr R Potgieter
Technical Signatory / Manager

Remarks :
The samples were subjected to analysis according to TMH 1
The results reported relate only to the sample tested
Further use of the above information is not the responsibility or liability of Roadlab
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Compiled By : Linda van Niekerk



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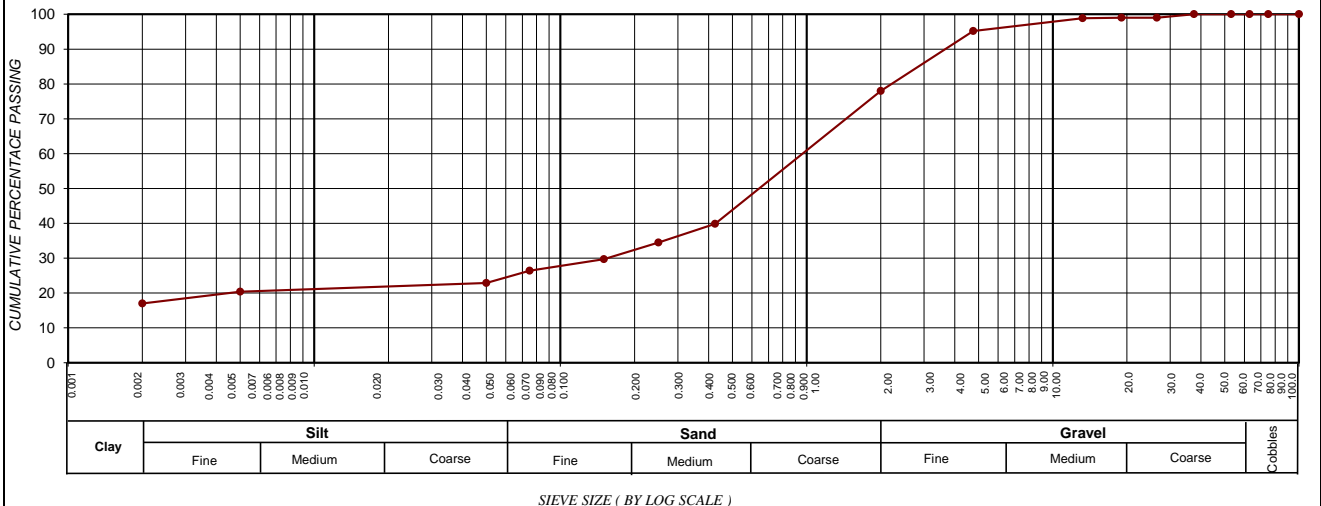
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 Germiston, JHB, 1400

OUR REF : 92/NKA001-02/0001/21	DATE RECEIVED : 04-May-21
CLIENT : Nkanivo Development Consultants	POSITION : TP1A
PROJECT : Dumphries Township Establishment	LAYER : 0.6-1.1m
	SAMPLE No. : S/8449
	SAMPLE DESCRIPTION : Light Red Brown Clayey Gravelly Sand

FOUNDATION INDICATOR - (SANS 3001-GR1, SANS 3001-GR10) & (ASTM Method D422)

Weighted PI	8.8	Specific Gravity	2.59
Sieve analysis Cumulative percentage passing (mm)	100.0	100	<div style="display: flex; justify-content: space-around;"> <div style="text-align: center;"> <p>POTENTIAL EXPANSIVENES</p> </div> <div style="text-align: center;"> <p>PLASTICITY CHART</p> </div> </div>
	75.0	100	
	63.0	100	
	50.0	100	
	37.5	100	
	28.0	99	
	20.0	99	
	14.0	99	
	5.00	95	
	2.000	78	
	0.425	40	
	0.250	34	
	0.150	30	
	0.075	26	
	50 µm	23	
5 µm	20		
2 µm	17.0		
Soil Mortar Analysis % < 2.00mm	2.000 - 0.425	49	<div style="text-align: center;"> <p>PERFORMANCE AS WEARING COURSE</p> </div>
	0.425 - 0.250	7	
	0.250 - 0.150	6	
	0.150 - 0.075	4	
< 0.075	34		
Effective size	0.002		
Uniformity Coefficient	629.1		
Curvature Coefficient	9.7		
Oversize Index	0.0		
Shrinkage Product	438.1		
Grading Coefficient	20.0		
Grading modulus	1.56		
Atterberg Limits	Liquid Limit	31	
	Plasticity Index	22	
	Linear Shrinkage	11.0	
	PI < 0.075	28	
Unified Soil Classification	SC		
U.S. Highway Classification	A-2-6 (1)		

PARTICLE SIZE DISTRIBUTION



CLAY (%) (0.001-0.002)	SILT (%) (0.002-0.060)	SAND (%) (0.060-2.00)	GRAVEL (%) (2.00-60.0)
17.0	7.0	53.9	22.0



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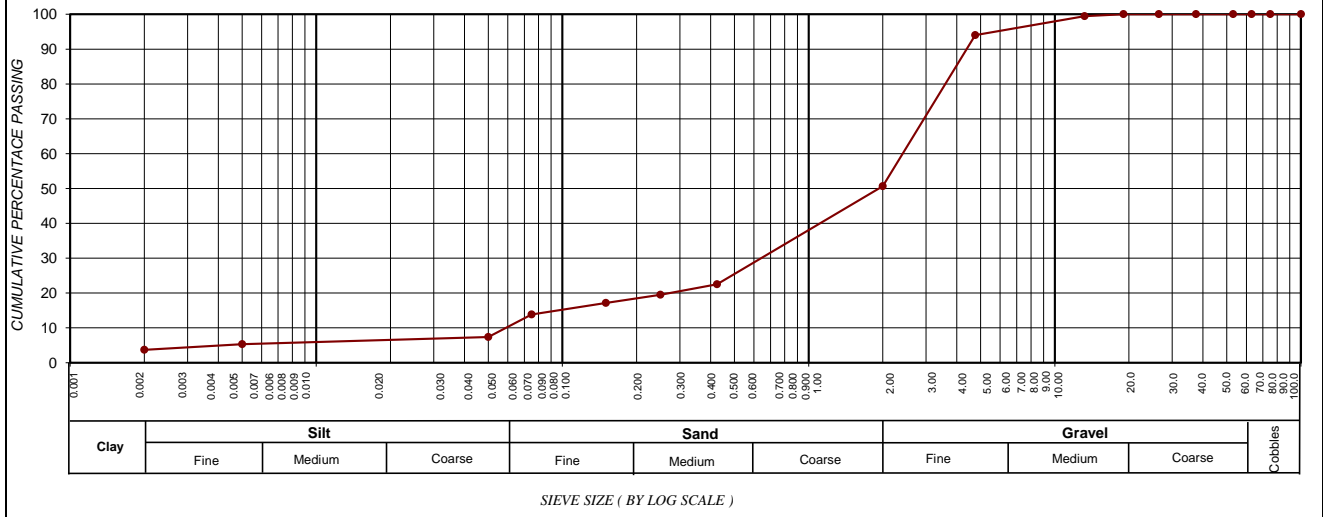
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 Germiston, JHB, 1400

OUR REF : 92/NKA001-02/0001/21	DATE RECEIVED : 04-May-21
CLIENT : Nkanivo Development Consultants	POSITION : TP2A
PROJECT : Dumphries Township Establishment	LAYER : 0.48-2.2m
	SAMPLE No. : S/8450
	SAMPLE DESCRIPTION : Light Brown Sandy Gravel

FOUNDATION INDICATOR - (SANS 3001-GR1, SANS 3001-GR10) & (ASTM Method D422)

Weighted PI	-	Specific Gravity	2.63		
Sieve analysis Cumulative percentage passing (mm)	100.0	100	<div style="display: flex; justify-content: space-around;"> <div style="text-align: center;"> <p>POTENTIAL EXPANSIVENES</p> </div> <div style="text-align: center;"> <p>PLASTICITY CHART</p> </div> </div>		
	75.0	100			
	63.0	100			
	50.0	100			
	37.5	100			
	28.0	100			
	20.0	100			
	14.0	99			
	5.00	94			
	2.000	51			
	0.425	23			
	0.250	19			
	0.150	17			
	0.075	14			
	50 µm	7			
5 µm	5				
2 µm	3.7				
Soil Mortar Analysis % < 2.00mm	2.000 - 0.425	56	<div style="text-align: center;"> <p>PERFORMANCE AS WEARING COURSE</p> </div>		
	0.425 - 0.250	6			
	0.250 - 0.150	5			
	0.150 - 0.075	6			
< 0.075	27				
Effective size		0.060			
Uniformity Coefficient		44.1			
Curvature Coefficient		4.5			
Oversize Index		0.0			
Shrinkage Product		0			
Grading Coefficient		46.4			
Grading modulus		2.13			
Atterberg Limits	Liquid Limit	-			
	Plasticity Index	NP			
	Linear Shrinkage	-			
	PI < 0.075	6			
Unified Soil Classification		SM			
U.S. Highway Classification		A-1-b (0)			

PARTICLE SIZE DISTRIBUTION



CLAY (%) (0.001-0.002)	SILT (%) (0.002-0.060)	SAND (%) (0.060-2.00)	GRAVEL (%) (2.00-60.0)
3.7	5.7	41.2	49.4



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OUR REF : 92/NKA001-02/0001/21	DATE RECEIVED : 04-May-21
CLIENT : Nkanivo Development Consultants	POSITION : TP3A
PROJECT : Dumphries Township Establishment	LAYER : 0.37-1.3m
	SAMPLE No. : S/8451
	SAMPLE DESCRIPTION : Light Brown Gravelly Sand

FOUNDATION INDICATOR - (SANS 3001-GR1, SANS 3001-GR10) & (ASTM Method D422)

Weighted PI	-	Specific Gravity	2.66	
Sieve analysis Cumulative percentage passing (mm)	100.0	100	<div style="display: flex; justify-content: space-around;"> <div style="text-align: center;"> <p>POTENTIAL EXPANSIVENES</p> </div> <div style="text-align: center;"> <p>PLASTICITY CHART</p> </div> </div>	
	75.0	100		
	63.0	100		
	50.0	100		
	37.5	100		
	28.0	100		
	20.0	100		
	14.0	99		
	5.00	94		
	2.000	63		
	0.425	16		
	0.250	15		
	0.150	11		
	0.075	8		
	50 µm	4		
5 µm	3			
2 µm	2.1			
Soil Mortar Analysis % < 2.00mm	2.000 - 0.425	74	<div style="text-align: center;"> <p>PERFORMANCE AS WEARING COURSE</p> </div>	
	0.425 - 0.250	2		
	0.250 - 0.150	6		
	0.150 - 0.075	5		
< 0.075	13			
Effective size		0.118		<div style="text-align: center;"> <p>PARTICLE SIZE DISTRIBUTION</p> </div>
Uniformity Coefficient		16.2		
Curvature Coefficient		3.5		
Oversize Index		0.0		
Shrinkage Product		0		
Grading Coefficient		35.1		
Grading modulus		2.13		
Atterberg Limits	Liquid Limit	-		
	Plasticity Index	NP		
	Linear Shrinkage	-		
	PI < 0.075	4		
Unified Soil Classification		SM		
U.S. Highway Classification		A-1-b (0)		

PARTICLE SIZE DISTRIBUTION										
Clay	Silt			Sand			Gravel			Cobbles
	Fine	Medium	Coarse	Fine	Medium	Coarse	Fine	Medium	Coarse	
SIEVE SIZE (BY LOG SCALE)										

CLAY (%) (0.001-0.002)	SILT (%) (0.002-0.060)	SAND (%) (0.060-2.00)	GRAVEL (%) (2.00-60.0)
2.1	3.1	57.4	37.4



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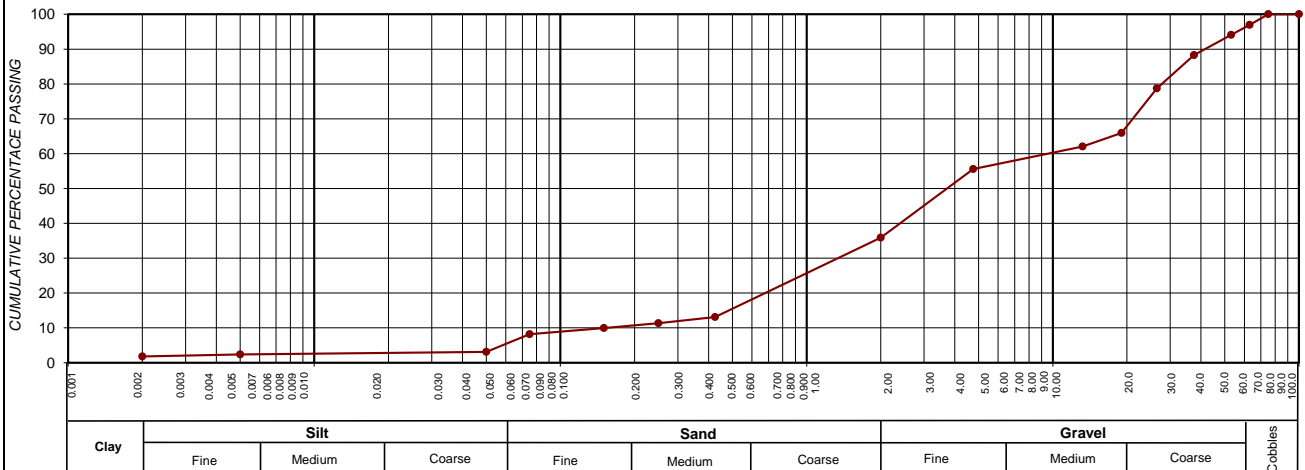
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OUR REF : 92/NKA001-02/0001/21	DATE RECEIVED : 04-May-21
CLIENT : Nkanivo Development Consultants	POSITION : TP5A
PROJECT : Dumphries Township Establishment	LAYER : 0.9-2.2m
	SAMPLE No. : S/8453A
	SAMPLE DESCRIPTION : Light Brown Sandy Gravel

FOUNDATION INDICATOR - (SANS 3001-GR1, SANS 3001-GR10) & (ASTM Method D422)

Weighted PI	0.4	Specific Gravity	2.63
Sieve analysis Cumulative percentage passing (mm)	100.0	100	<div style="display: flex; justify-content: space-around;"> <div style="text-align: center;"> <p>POTENTIAL EXPANSIVENES</p> </div> <div style="text-align: center;"> <p>PLASTICITY CHART</p> </div> </div>
	75.0	100	
	63.0	97	
	50.0	94	
	37.5	88	
	28.0	79	
	20.0	66	
	14.0	62	
	5.00	56	
	2.000	36	
	0.425	13	
	0.250	11	
	0.150	10	
	0.075	8	
50 µm	3		
5 µm	2		
2 µm	1.8		
Soil Mortar Analysis % < 2.00mm	2.000 - 0.425	64	<div style="text-align: center;"> <p>PERFORMANCE AS WEARING COURSE</p> </div>
	0.425 - 0.250	5	
	0.250 - 0.150	4	
	0.150 - 0.075	5	
< 0.075	23		
Effective size	0.152		
Uniformity Coefficient	73.0		
Curvature Coefficient	1.5		
Oversize Index	11.7		
Shrinkage Product	19.6		
Grading Coefficient	23.8		
Grading modulus	2.43		
Atterberg Limits	Liquid Limit	20	
	Plasticity Index	3	
	Linear Shrinkage	1.5	
	PI < 0.075	10	
Unified Soil Classification	SM		
U.S. Highway Classification	A-1-a (0)		

PARTICLE SIZE DISTRIBUTION



SIEVE SIZE (BY LOG SCALE)

CLAY (%) (0.001-0.002)	SILT (%) (0.002-0.060)	SAND (%) (0.060-2.00)	GRAVEL (%) (2.00-60.0)
1.8	2.6	31.5	64.1



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OUR REF : 92/NKA001-02/0001/21	DATE RECEIVED : 04-May-21
CLIENT : Nkanivo Development Consultants	POSITION : TP5B
PROJECT : Dumphries Township Establishment	LAYER : 0.5-0.9m
	SAMPLE No. : S/8453B
	SAMPLE DESCRIPTION : Dark Brown Gravelly Silty Clayey Sand

FOUNDATION INDICATOR - (SANS 3001-GR1, SANS 3001-GR10) & (ASTM Method D422)

Weighted PI	9.0	Specific Gravity	2.57	
Sieve analysis Cumulative percentage passing (mm)	100.0	100	<div style="display: flex; justify-content: space-around;"> <div style="text-align: center;"> <p>POTENTIAL EXPANSIVENES</p> </div> <div style="text-align: center;"> <p>PLASTICITY CHART</p> </div> </div>	
	75.0	100		
	63.0	100		
	50.0	100		
	37.5	100		
	28.0	100		
	20.0	100		
	14.0	100		
	5.00	97		
	2.000	89		
	0.425	64		
	0.250	55		
	0.150	44		
	0.075	42		
	50 µm	39		
5 µm	36			
2 µm	28.3			
Soil Mortar Analysis % < 2.00mm	2.000 - 0.425	28	<div style="text-align: center;"> <p>PERFORMANCE AS WEARING COURSE</p> </div>	
	0.425 - 0.250	11		
	0.250 - 0.150	12		
	0.150 - 0.075	9		
< 0.075	41			
Effective size	0.002			
Uniformity Coefficient	172.5			
Curvature Coefficient	0.0			
Oversize Index	0.0			
Shrinkage Product	451.4			
Grading Coefficient	10.7			
Grading modulus	1.05			
Atterberg Limits	Liquid Limit	37		<div style="text-align: center;"> <p>PARTICLE SIZE DISTRIBUTION</p> </div>
	Plasticity Index	14		
	Linear Shrinkage	7.0		
	PI < 0.075	20		
Unified Soil Classification	SC			
U.S. Highway Classification	A-6 (2)			

CLAY (%) (0.001-0.002)	SILT (%) (0.002-0.060)	SAND (%) (0.060-2.00)	GRAVEL (%) (2.00-60.0)
28.3	12.1	48.6	11.0



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OUR REF : 92/NKA001-02/0001/21	DATE RECEIVED : 04-May-21
CLIENT : Nkanivo Development Consultants	POSITION : TP6A
PROJECT : Dumphries Township Establishment	LAYER : 0.48-1.8m
	SAMPLE No. : S/8454
	SAMPLE DESCRIPTION : Light Red Brown Sandy Gravel

FOUNDATION INDICATOR - (SANS 3001-GR1, SANS 3001-GR10) & (ASTM Method D422)

Weighted PI	-	Specific Gravity	2.61	
Sieve analysis Cumulative percentage passing (mm)	100.0	100	<div style="display: flex; justify-content: space-around;"> <div style="text-align: center;"> <p>POTENTIAL EXPANSIVENES</p> </div> <div style="text-align: center;"> <p>PLASTICITY CHART</p> </div> </div>	
	75.0	100		
	63.0	100		
	50.0	100		
	37.5	100		
	28.0	99		
	20.0	96		
	14.0	95		
	5.00	76		
	2.000	49		
	0.425	23		
	0.250	21		
	0.150	17		
	0.075	13		
	50 µm	10		
5 µm	8			
2 µm	5.4			
Soil Mortar Analysis % < 2.00mm	2.000 - 0.425	54	<div style="text-align: center;"> <p>PERFORMANCE AS WEARING COURSE</p> </div>	
	0.425 - 0.250	4		
	0.250 - 0.150	8		
	0.150 - 0.075	8		
< 0.075	27			
Effective size		0.053		<div style="text-align: center;"> <p>PARTICLE SIZE DISTRIBUTION</p> </div>
Uniformity Coefficient		61.5		
Curvature Coefficient		4.4		
Oversize Index		0.0		
Shrinkage Product		0		
Grading Coefficient		37.7		
Grading modulus		2.15		
Atterberg Limits	Liquid Limit	-		
	Plasticity Index	NP		
	Linear Shrinkage	-		
	PI < 0.075	2		
Unified Soil Classification		SM		
U.S. Highway Classification		A-1-a (0)		

CLAY (%) (0.001-0.002)	SILT (%) (0.002-0.060)	SAND (%) (0.060-2.00)	GRAVEL (%) (2.00-60.0)
5.4	5.4	38.2	51.1



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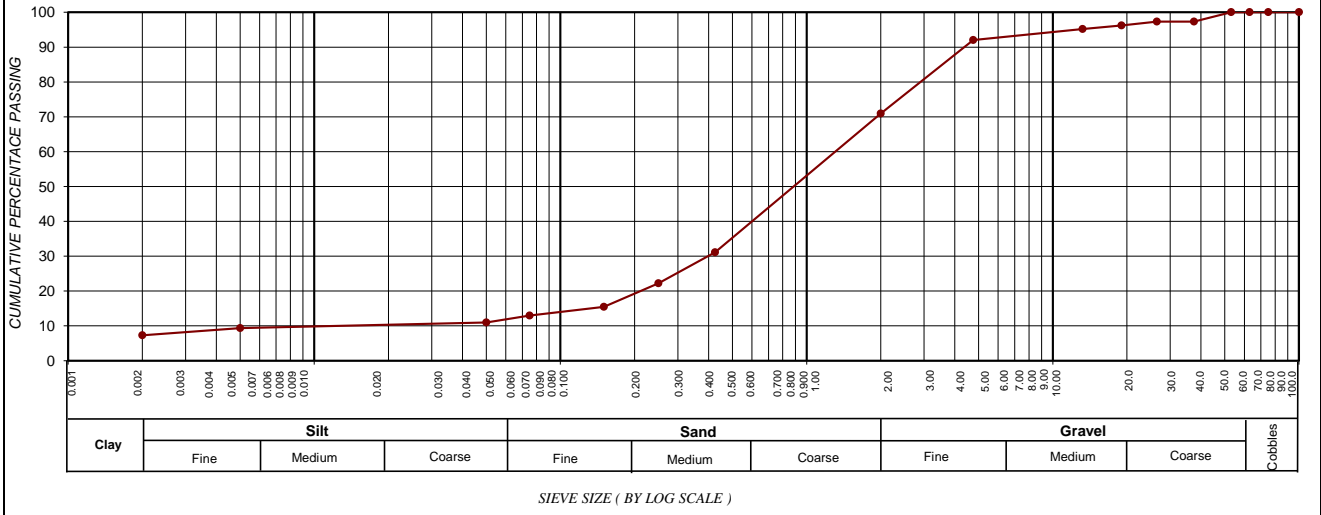
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OUR REF : 92/NKA001-02/0001/21	DATE RECEIVED : 04-May-21
CLIENT : Nkanivo Development Consultants	POSITION : TP7A
PROJECT : Dumphries Township Establishment	LAYER : 0.45-3.0m
	SAMPLE No. : S/8455
	SAMPLE DESCRIPTION : Light Red Brown Gravelly Sand

FOUNDATION INDICATOR - (SANS 3001-GR1, SANS 3001-GR10) & (ASTM Method D422)

Weighted PI	-	Specific Gravity	2.47
Sieve analysis Cumulative percentage passing (mm)	100.0	100	<div style="display: flex; justify-content: space-around;"> <div style="text-align: center;"> <p>POTENTIAL EXPANSIVENES</p> </div> <div style="text-align: center;"> <p>PLASTICITY CHART</p> </div> </div>
	75.0	100	
	63.0	100	
	50.0	100	
	37.5	97	
	28.0	97	
	20.0	96	
	14.0	95	
	5.00	92	
	2.000	71	
	0.425	31	
	0.250	22	
	0.150	15	
	0.075	13	
	50 µm	11	
5 µm	9		
2 µm	7.3		
Soil Mortar Analysis % < 2.00mm	2.000 - 0.425	56	<div style="text-align: center;"> <p>PERFORMANCE AS WEARING COURSE</p> </div>
	0.425 - 0.250	13	
	0.250 - 0.150	10	
	0.150 - 0.075	7	
< 0.075	15		
Effective size	0.022		
Uniformity Coefficient	71.7		
Curvature Coefficient	4.7		
Oversize Index	2.7		
Shrinkage Product	0		
Grading Coefficient	24.3		
Grading modulus	1.85		
Atterberg Limits	Liquid Limit	-	
	Plasticity Index	NP	
	Linear Shrinkage	-	
	PI < 0.075	NP	
Unified Soil Classification	SM		
U.S. Highway Classification	A-1-b (0)		

PARTICLE SIZE DISTRIBUTION



CLAY (%) (0.001-0.002)	SILT (%) (0.002-0.060)	SAND (%) (0.060-2.00)	GRAVEL (%) (2.00-60.0)
7.3	5.5	58.1	29.1



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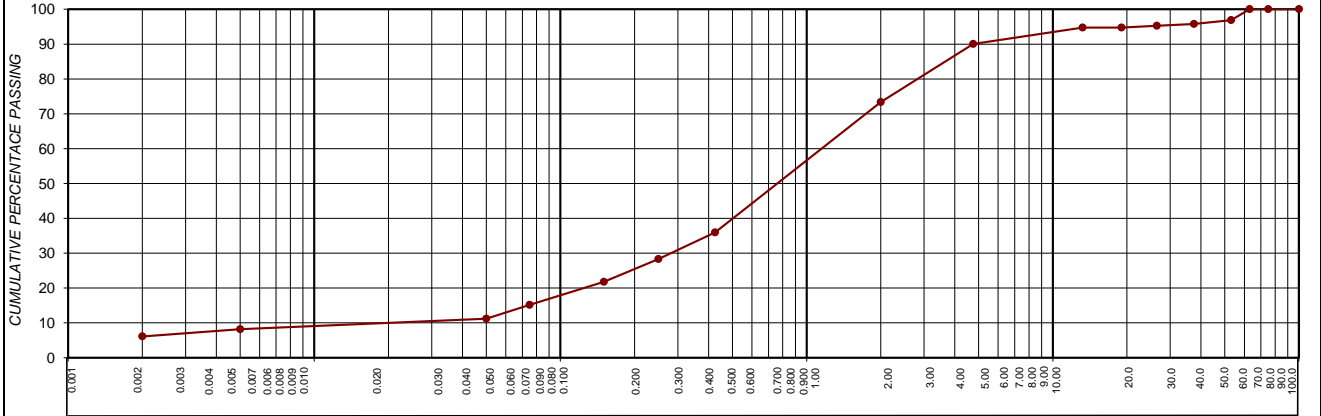
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OUR REF : 92/NKA001-02/0001/21	DATE RECEIVED : 04-May-21
CLIENT : Nkanivo Development Consultants	POSITION : TP8A
PROJECT : Dumphries Township Establishment	LAYER : 0.4-2.7m
	SAMPLE No. : S/8456
	SAMPLE DESCRIPTION : Light Brown Gravelly Sand

FOUNDATION INDICATOR - (SANS 3001-GR1, SANS 3001-GR10) & (ASTM Method D422)

Weighted PI	-	Specific Gravity	2.64		
Sieve analysis Cumulative percentage passing (mm)	100.0	100	<div style="display: flex; justify-content: space-around;"> <div style="text-align: center;"> <p>POTENTIAL EXPANSIVENES</p> </div> <div style="text-align: center;"> <p>PLASTICITY CHART</p> </div> </div>		
	75.0	100			
	63.0	100			
	50.0	97			
	37.5	96			
	28.0	95			
	20.0	95			
	14.0	95			
	5.00	90			
	2.000	73			
	0.425	36			
	0.250	28			
	0.150	22			
	0.075	15			
	50 µm	11			
5 µm	8				
2 µm	6.1				
Soil Mortar Analysis % < 2.00mm	2.000 - 0.425	51	<div style="text-align: center;"> <p>PERFORMANCE AS WEARING COURSE</p> </div>		
	0.425 - 0.250	10			
	0.250 - 0.150	9			
	0.150 - 0.075	9			
< 0.075	21				
Effective size		0.032			
Uniformity Coefficient		44.9			
Curvature Coefficient		1.8			
Oversize Index		4.2			
Shrinkage Product		0			
Grading Coefficient		19.7			
Grading modulus		1.76			
Atterberg Limits	Liquid Limit	-			
	Plasticity Index	NP			
	Linear Shrinkage	-			
	PI < 0.075	2			
Unified Soil Classification		SM			
U.S. Highway Classification		A-1-b (0)			

PARTICLE SIZE DISTRIBUTION



SIEVE SIZE (BY LOG SCALE)

CLAY (%) (0.001-0.002)	SILT (%) (0.002-0.060)	SAND (%) (0.060-2.00)	GRAVEL (%) (2.00-60.0)
6.1	6.4	60.8	26.7



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OUR REF : 92/NKA001-02/0001/21	DATE RECEIVED : 04-May-21
CLIENT : Nkanivo Development Consultants	POSITION : TP9A
PROJECT : Dumphries Township Establishment	LAYER : 0.8-2.5m
	SAMPLE No. : S/8457
	SAMPLE DESCRIPTION : Light Red Orange Gravelly Sand

FOUNDATION INDICATOR - (SANS 3001-GR1, SANS 3001-GR10) & (ASTM Method D422)

Weighted PI	-	Specific Gravity	2.58	
Sieve analysis Cumulative percentage passing (mm)	100.0	100	<div style="display: flex; justify-content: space-around;"> <div style="text-align: center;"> <p>POTENTIAL EXPANSIVENES</p> </div> <div style="text-align: center;"> <p>PLASTICITY CHART</p> </div> </div>	
	75.0	100		
	63.0	100		
	50.0	100		
	37.5	100		
	28.0	100		
	20.0	100		
	14.0	100		
	5.00	95		
	2.000	63		
	0.425	30		
	0.250	27		
	0.150	19		
	0.075	13		
	50 µm	10		
5 µm	7			
2 µm	5.7			
Soil Mortar Analysis % < 2.00mm	2.000 - 0.425	53	<div style="text-align: center;"> <p>PERFORMANCE AS WEARING COURSE</p> </div>	
	0.425 - 0.250	4		
	0.250 - 0.150	13		
	0.150 - 0.075	9		
< 0.075	20			
Effective size		0.051		<div style="text-align: center;"> <p>PARTICLE SIZE DISTRIBUTION</p> </div>
Uniformity Coefficient		36.2		
Curvature Coefficient		2.0		
Oversize Index		0.0		
Shrinkage Product		0		
Grading Coefficient		34.9		
Grading modulus		1.94		
Atterberg Limits	Liquid Limit	-		
	Plasticity Index	NP		
	Linear Shrinkage	-		
	PI < 0.075	NP		
Unified Soil Classification		SM		
U.S. Highway Classification		A-1-b (0)		

CLAY (%) (0.001-0.002)	SILT (%) (0.002-0.060)	SAND (%) (0.060-2.00)	GRAVEL (%) (2.00-60.0)
5.7	5.4	52.2	36.7



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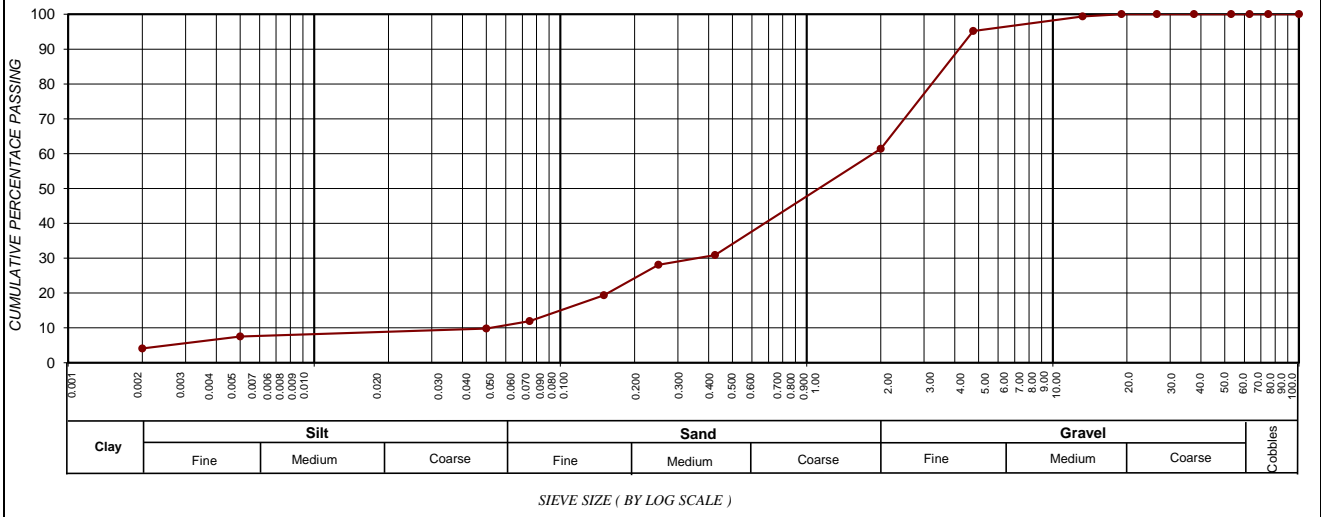
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OUR REF : 92/NKA001-02/0001/21	DATE RECEIVED : 04-May-21
CLIENT : Nkanivo Development Consultants	POSITION : TP10A
PROJECT : Dumphries Township Establishment	LAYER : 0.3-2.5mm
	SAMPLE No. : S/8458
	SAMPLE DESCRIPTION : Light Red Orange Gravelly Sand

FOUNDATION INDICATOR - (SANS 3001-GR1, SANS 3001-GR10) & (ASTM Method D422)

Weighted PI	-	Specific Gravity	2.64
Sieve analysis Cumulative percentage passing (mm)	100.0	100	<div style="display: flex; justify-content: space-around;"> <div style="text-align: center;"> <p>POTENTIAL EXPANSIVENES</p> </div> <div style="text-align: center;"> <p>PLASTICITY CHART</p> </div> </div>
	75.0	100	
	63.0	100	
	50.0	100	
	37.5	100	
	28.0	100	
	20.0	100	
	14.0	99	
	5.00	95	
	2.000	61	
	0.425	31	
	0.250	28	
	0.150	19	
	0.075	12	
	50 µm	10	
5 µm	8		
2 µm	4.1		
Soil Mortar Analysis % < 2.00mm	2.000 - 0.425	50	<div style="text-align: center;"> <p>PERFORMANCE AS WEARING COURSE</p> </div>
	0.425 - 0.250	5	
	0.250 - 0.150	14	
	0.150 - 0.075	12	
< 0.075	19		
Effective size	0.052		
Uniformity Coefficient	36.8		
Curvature Coefficient	1.3		
Oversize Index	0.0		
Shrinkage Product	0		
Grading Coefficient	36.7		
Grading modulus	1.96		
Atterberg Limits	Liquid Limit	-	
	Plasticity Index	NP	
	Linear Shrinkage	-	
	PI < 0.075	NP	
Unified Soil Classification	SM		
U.S. Highway Classification	A-1-b (0)		

PARTICLE SIZE DISTRIBUTION



CLAY (%) (0.001-0.002)	SILT (%) (0.002-0.060)	SAND (%) (0.060-2.00)	GRAVEL (%) (2.00-60.0)
4.1	6.4	50.9	38.6



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OUR REF : 92/NKA001-02/0001/21	DATE RECEIVED : 04-May-21
CLIENT : Nkanivo Development Consultants	POSITION : TP11A
PROJECT : Dumphries Township Establishment	LAYER : 0.43-2.6m
	SAMPLE No. : S/8459
	SAMPLE DESCRIPTION : Light Red Orange Gravelly Sand

FOUNDATION INDICATOR - (SANS 3001-GR1, SANS 3001-GR10) & (ASTM Method D422)

Weighted PI	-	Specific Gravity	2.64	
Sieve analysis Cumulative percentage passing (mm)	100.0	100	<div style="display: flex; justify-content: space-around;"> <div style="text-align: center;"> <p>POTENTIAL EXPANSIVENES</p> </div> <div style="text-align: center;"> <p>PLASTICITY CHART</p> </div> </div>	
	75.0	100		
	63.0	100		
	50.0	100		
	37.5	100		
	28.0	100		
	20.0	100		
	14.0	100		
	5.00	95		
	2.000	68		
	0.425	30		
	0.250	27		
	0.150	20		
	0.075	13		
	50 µm	11		
5 µm	9			
2 µm	5.4			
Soil Mortar Analysis % < 2.00mm	2.000 - 0.425	57	<div style="text-align: center;"> <p>PERFORMANCE AS WEARING COURSE</p> </div>	
	0.425 - 0.250	3		
	0.250 - 0.150	11		
	0.150 - 0.075	10		
< 0.075	19			
Effective size		0.035		<div style="text-align: center;"> <p>PARTICLE SIZE DISTRIBUTION</p> </div>
Uniformity Coefficient		47.4		
Curvature Coefficient		3.3		
Oversize Index		0.0		
Shrinkage Product		0		
Grading Coefficient		30.0		
Grading modulus		1.89		
Atterberg Limits	Liquid Limit	-		
	Plasticity Index	NP		
	Linear Shrinkage	-		
	PI < 0.075	NP		
Unified Soil Classification		SM		
U.S. Highway Classification		A-1-b (0)		

CLAY (%) (0.001-0.002)	SILT (%) (0.002-0.060)	SAND (%) (0.060-2.00)	GRAVEL (%) (2.00-60.0)
5.4	6.1	56.9	31.6



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OUR REF : 92/NKA001-02/0001/21 **DATE RECEIVED :** 04-May-21
CLIENT : Nkanivo Development Consultants **POSITION :** TP12A
PROJECT : Dumphries Township Establishment **LAYER :** 0.6-1.8m
SAMPLE No. : S/8460
SAMPLE DESCRIPTION : Light Red Brown Gravelly Sand

FOUNDATION INDICATOR - (SANS 3001-GR1, SANS 3001-GR10) & (ASTM Method D422)

Weighted PI	-	Specific Gravity	2.72
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Sieve analysis Cumulative percentage passing (mm)	100.0	100
	75.0	100
	63.0	100
	50.0	100
	37.5	100
	28.0	99
	20.0	96
	14.0	93
	5.00	90
	2.000	57
	0.425	25
	0.250	20
	0.150	16
	0.075	13
	50 µm	7
5 µm	5	
2 µm	3.3	

Soil Mortar Analysis % < 2.00mm	2.000 - 0.425	57
	0.425 - 0.250	8
	0.250 - 0.150	7
	0.150 - 0.075	6
	< 0.075	23

Effective size	0.063
Uniformity Coefficient	36.5
Curvature Coefficient	3.3
Oversize Index	0.0
Shrinkage Product	0
Grading Coefficient	38.1
Grading modulus	2.06

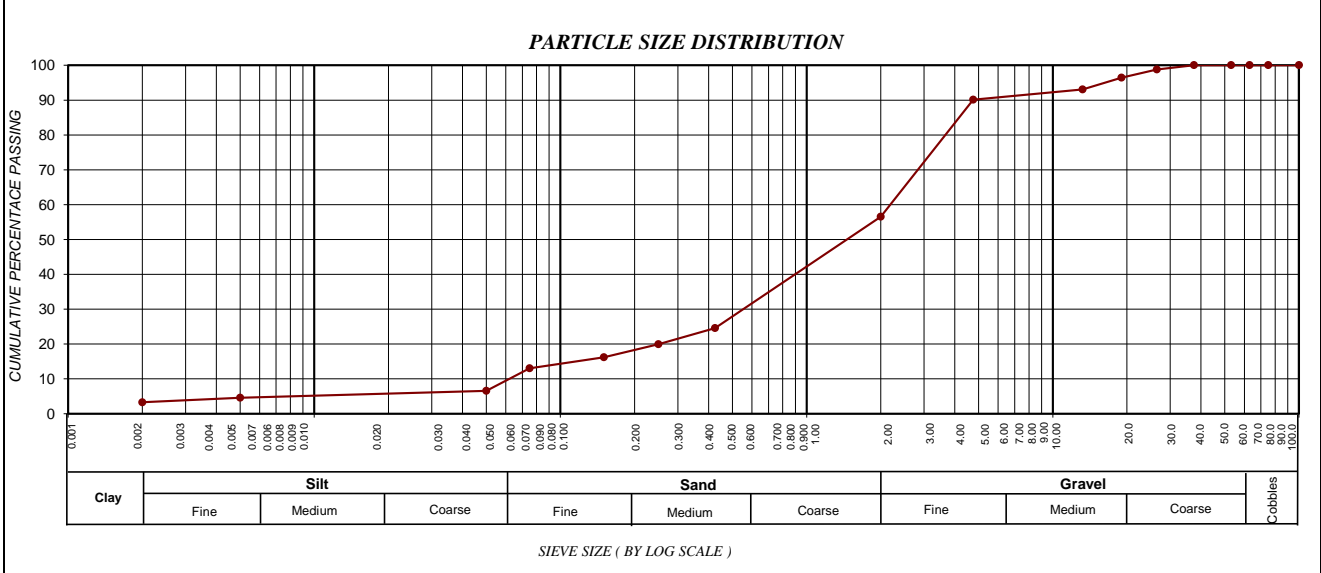
Atterberg Limits	Liquid Limit	-
	Plasticity Index	NP
	Linear Shrinkage	-
	PI < 0.075	NP

Unified Soil Classification	SM
U.S. Highway Classification	A-1-b (0)

POTENTIAL EXPANSIVENES

PLASTICITY CHART

PERFORMANCE AS WEARING COURSE



CLAY (%) (0.001-0.002)	SILT (%) (0.002-0.060)	SAND (%) (0.060-2.00)	GRAVEL (%) (2.00-60.0)
3.3	5.3	48.0	43.4



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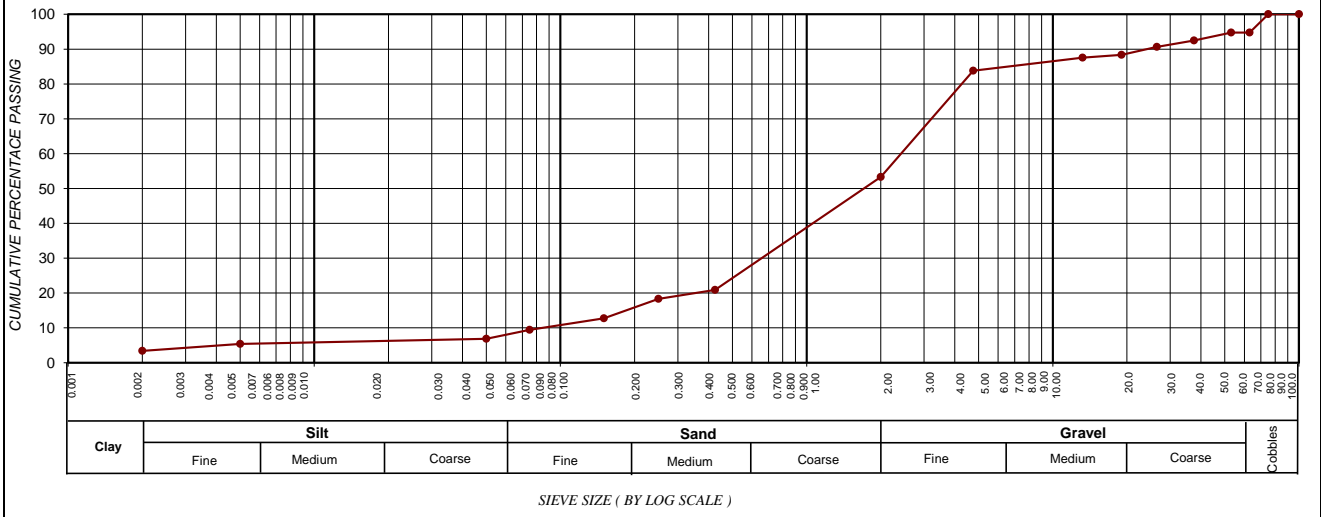
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OUR REF : 92/NKA001-02/0001/21	DATE RECEIVED : 04-May-21
CLIENT : Nkanivo Development Consultants	POSITION : TP13A
PROJECT : Dumphries Township Establishment	LAYER : 0.58-1.7m
	SAMPLE No. : S/8461
	SAMPLE DESCRIPTION : Light Red Brown Sandy Gravel

FOUNDATION INDICATOR - (SANS 3001-GR1, SANS 3001-GR10) & (ASTM Method D422)

Weighted PI	-	Specific Gravity	2.64	
Sieve analysis Cumulative percentage passing (mm)	100.0	100	<div style="display: flex; justify-content: space-around;"> <div style="text-align: center;"> <p>POTENTIAL EXPANSIVENES</p> </div> <div style="text-align: center;"> <p>PLASTICITY CHART</p> </div> </div>	
	75.0	100		
	63.0	95		
	50.0	95		
	37.5	92		
	28.0	91		
	20.0	88		
	14.0	88		
	5.00	84		
	2.000	53		
	0.425	21		
	0.250	18		
	0.150	13		
	0.075	9		
50 µm	7			
5 µm	5			
2 µm	3.4			
Soil Mortar Analysis % < 2.00mm	2.000 - 0.425	61	<div style="text-align: center;"> <p>PERFORMANCE AS WEARING COURSE</p> </div>	
	0.425 - 0.250	5		
	0.250 - 0.150	10		
	0.150 - 0.075	6		
< 0.075	18			
Effective size		0.088		
Uniformity Coefficient		30.3		
Curvature Coefficient		3.2		
Oversize Index		7.5		
Shrinkage Product		0		
Grading Coefficient		31.3		
Grading modulus		2.17		
Atterberg Limits	Liquid Limit	-		
	Plasticity Index	NP		
	Linear Shrinkage	-		
	PI < 0.075	4		
Unified Soil Classification		SM		
U.S. Highway Classification		A-1-b (0)		

PARTICLE SIZE DISTRIBUTION



CLAY (%) (0.001-0.002)	SILT (%) (0.002-0.060)	SAND (%) (0.060-2.00)	GRAVEL (%) (2.00-60.0)
3.4	4.2	45.7	46.7



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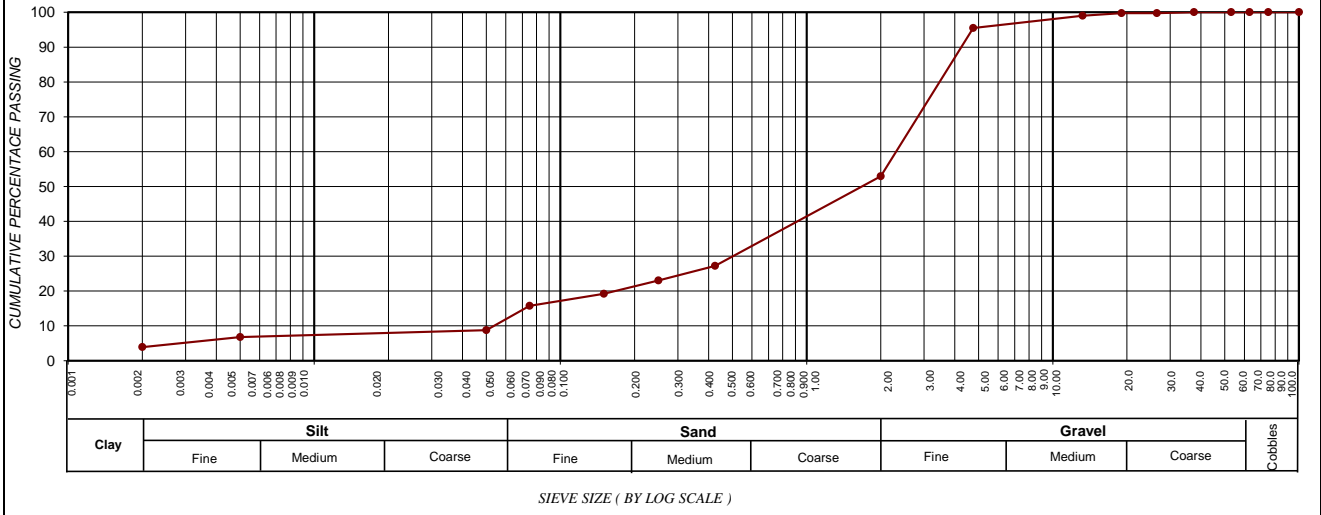
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OUR REF : 92/NKA001-02/0001/21	DATE RECEIVED : 04-May-21
CLIENT : Nkanivo Development Consultants	POSITION : TP14A
PROJECT : Dumphries Township Establishment	LAYER : 0.4-1.2m
	SAMPLE No. : S/8462
	SAMPLE DESCRIPTION : Light Red Orange Sandy Gravel

FOUNDATION INDICATOR - (SANS 3001-GR1, SANS 3001-GR10) & (ASTM Method D422)

Weighted PI	-	Specific Gravity	2.64
Sieve analysis Cumulative percentage passing (mm)	100.0	100	<div style="display: flex; justify-content: space-around;"> <div style="text-align: center;"> <p>POTENTIAL EXPANSIVENES</p> </div> <div style="text-align: center;"> <p>PLASTICITY CHART</p> </div> </div>
	75.0	100	
	63.0	100	
	50.0	100	
	37.5	100	
	28.0	100	
	20.0	100	
	14.0	99	
	5.00	95	
	2.000	53	
	0.425	27	
	0.250	23	
	0.150	19	
	0.075	16	
	50 µm	9	
5 µm	7		
2 µm	3.9		
Soil Mortar Analysis % < 2.00mm	2.000 - 0.425	49	<div style="text-align: center;"> <p>PERFORMANCE AS WEARING COURSE</p> </div>
	0.425 - 0.250	8	
	0.250 - 0.150	7	
	0.150 - 0.075	7	
< 0.075	30		
Effective size	0.054		
Uniformity Coefficient	46.0		
Curvature Coefficient	2.6		
Oversize Index	0.0		
Shrinkage Product	0		
Grading Coefficient	44.6		
Grading modulus	2.04		
Atterberg Limits	Liquid Limit	-	
	Plasticity Index	NP	
	Linear Shrinkage	-	
	PI < 0.075	4	
Unified Soil Classification	SM		
U.S. Highway Classification	A-1-b (0)		

PARTICLE SIZE DISTRIBUTION



CLAY (%) (0.001-0.002)	SILT (%) (0.002-0.060)	SAND (%) (0.060-2.00)	GRAVEL (%) (2.00-60.0)
3.9	7.0	42.0	47.1



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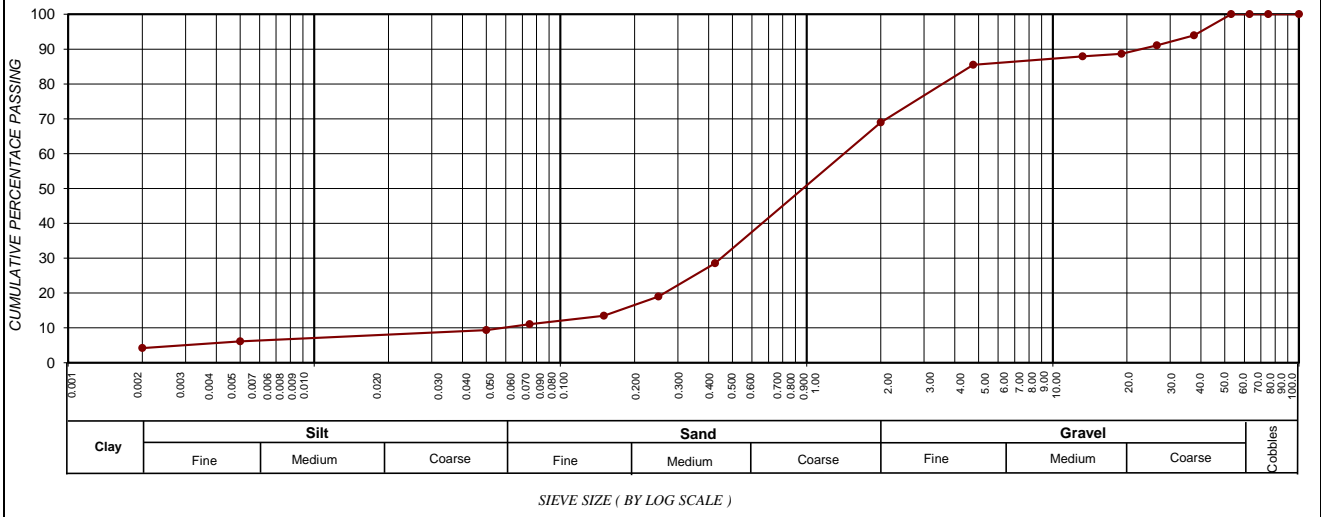
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OUR REF : 92/NKA001-02/0001/21	DATE RECEIVED : 04-May-21
CLIENT : Nkanivo Development Consultants	POSITION : TP15A
PROJECT : Dumphries Township Establishment	LAYER : 0.38-1.5m
	SAMPLE No. : S/8463
	SAMPLE DESCRIPTION : Light Brown Gravelly Sand

FOUNDATION INDICATOR - (SANS 3001-GR1, SANS 3001-GR10) & (ASTM Method D422)

Weighted PI	-	Specific Gravity	2.62
Sieve analysis Cumulative percentage passing (mm)	100.0	100	<div style="display: flex; justify-content: space-around;"> <div style="text-align: center;"> <p>POTENTIAL EXPANSIVENES</p> </div> <div style="text-align: center;"> <p>PLASTICITY CHART</p> </div> </div>
	75.0	100	
	63.0	100	
	50.0	100	
	37.5	94	
	28.0	91	
	20.0	89	
	14.0	88	
	5.00	85	
	2.000	69	
	0.425	29	
	0.250	19	
	0.150	13	
	0.075	11	
	50 µm	9	
5 µm	6		
2 µm	4.2		
Soil Mortar Analysis % < 2.00mm	2.000 - 0.425	59	<div style="text-align: center;"> <p>PERFORMANCE AS WEARING COURSE</p> </div>
	0.425 - 0.250	14	
	0.250 - 0.150	8	
	0.150 - 0.075	3	
< 0.075	16		
Effective size	0.059		
Uniformity Coefficient	28.0		
Curvature Coefficient	2.4		
Oversize Index	6.1		
Shrinkage Product	0		
Grading Coefficient	18.9		
Grading modulus	1.91		
Atterberg Limits	Liquid Limit	-	
	Plasticity Index	NP	
	Linear Shrinkage	-	
	PI < 0.075	8	
Unified Soil Classification	SM		
U.S. Highway Classification	A-1-b (0)		

PARTICLE SIZE DISTRIBUTION



CLAY (%) (0.001-0.002)	SILT (%) (0.002-0.060)	SAND (%) (0.060-2.00)	GRAVEL (%) (2.00-60.0)
4.2	5.8	58.9	31.0



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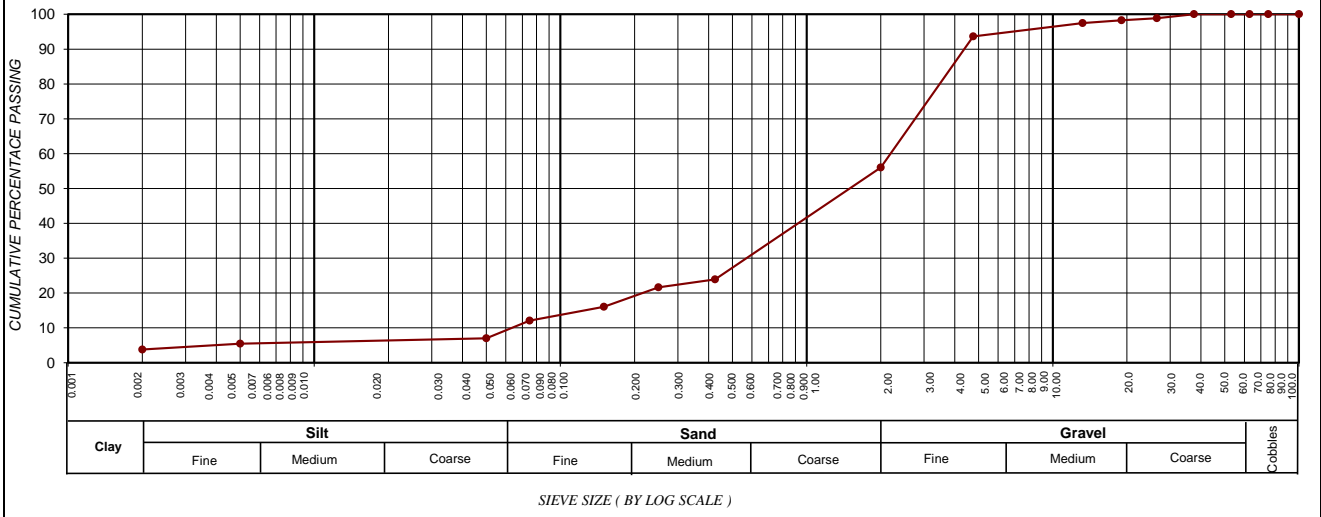
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OUR REF : 92/NKA001-02/0001/21	DATE RECEIVED : 04-May-21
CLIENT : Nkanivo Development Consultants	POSITION : TP16A
PROJECT : Dumphries Township Establishment	LAYER : 0.45-1.6m
	SAMPLE No. : S/8464
	SAMPLE DESCRIPTION : Light Red Orange Gravelly Sand

FOUNDATION INDICATOR - (SANS 3001-GR1, SANS 3001-GR10) & (ASTM Method D422)

Weighted PI	-	Specific Gravity	2.59		
Sieve analysis Cumulative percentage passing (mm)	100.0	100	<div style="display: flex; justify-content: space-around;"> <div style="text-align: center;"> <p>POTENTIAL EXPANSIVENES</p> </div> <div style="text-align: center;"> <p>PLASTICITY CHART</p> </div> </div>		
	75.0	100			
	63.0	100			
	50.0	100			
	37.5	100			
	28.0	99			
	20.0	98			
	14.0	97			
	5.00	94			
	2.000	56			
	0.425	24			
	0.250	22			
	0.150	16			
	0.075	12			
	50 µm	7			
5 µm	6				
2 µm	3.8				
Soil Mortar Analysis % < 2.00mm	2.000 - 0.425	57	<div style="text-align: center;"> <p>PERFORMANCE AS WEARING COURSE</p> </div>		
	0.425 - 0.250	4			
	0.250 - 0.150	10			
	0.150 - 0.075	7			
< 0.075	22				
Effective size		0.065			
Uniformity Coefficient		35.8			
Curvature Coefficient		3.5			
Oversize Index		0.0			
Shrinkage Product		0			
Grading Coefficient		40.1			
Grading modulus		2.08			
Atterberg Limits	Liquid Limit	-			
	Plasticity Index	NP			
	Linear Shrinkage	-			
	PI < 0.075	6			
Unified Soil Classification		SM			
U.S. Highway Classification		A-1-b (0)			

PARTICLE SIZE DISTRIBUTION



CLAY (%) (0.001-0.002)	SILT (%) (0.002-0.060)	SAND (%) (0.060-2.00)	GRAVEL (%) (2.00-60.0)
3.8	4.7	47.6	44.0



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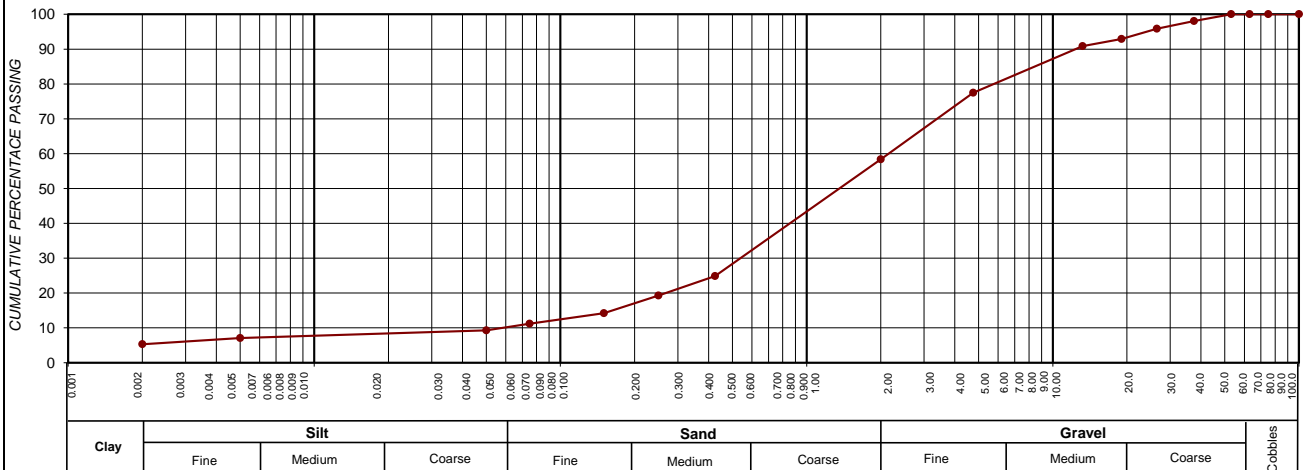
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OUR REF : 92/NKA001-02/0001/21	DATE RECEIVED : 04-May-21
CLIENT : Nkanivo Development Consultants	POSITION : TP17A
PROJECT : Dumphries Township Establishment	LAYER : 0.4-1.83m
	SAMPLE No. : S/8465
	SAMPLE DESCRIPTION : Light Red Brown Gravelly Sand

FOUNDATION INDICATOR - (SANS 3001-GR1, SANS 3001-GR10) & (ASTM Method D422)

Weighted PI	-	Specific Gravity	2.60
Sieve analysis Cumulative percentage passing (mm)	100.0	100	
	75.0	100	
	63.0	100	
	50.0	100	
	37.5	98	
	28.0	96	
	20.0	93	
	14.0	91	
	5.00	77	
	2.000	58	
	0.425	25	
	0.250	19	
	0.150	14	
	0.075	11	
	50 µm	9	
5 µm	7		
2 µm	5.3		
Soil Mortar Analysis % < 2.00mm	2.000 - 0.425	57	
	0.425 - 0.250	10	
	0.250 - 0.150	9	
	0.150 - 0.075	5	
< 0.075	19		
Effective size	0.059		
Uniformity Coefficient	38.1		
Curvature Coefficient	3.3		
Oversize Index	2.0		
Shrinkage Product	0		
Grading Coefficient	29.0		
Grading modulus	2.06		
Atterberg Limits	Liquid Limit		-
	Plasticity Index		NP
	Linear Shrinkage		-
	PI < 0.075	3	
Unified Soil Classification	SM		
U.S. Highway Classification	A-1-b (0)		

PARTICLE SIZE DISTRIBUTION



SIEVE SIZE (BY LOG SCALE)

CLAY (%) (0.001-0.002)	SILT (%) (0.002-0.060)	SAND (%) (0.060-2.00)	GRAVEL (%) (2.00-60.0)
5.3	4.6	48.4	41.6



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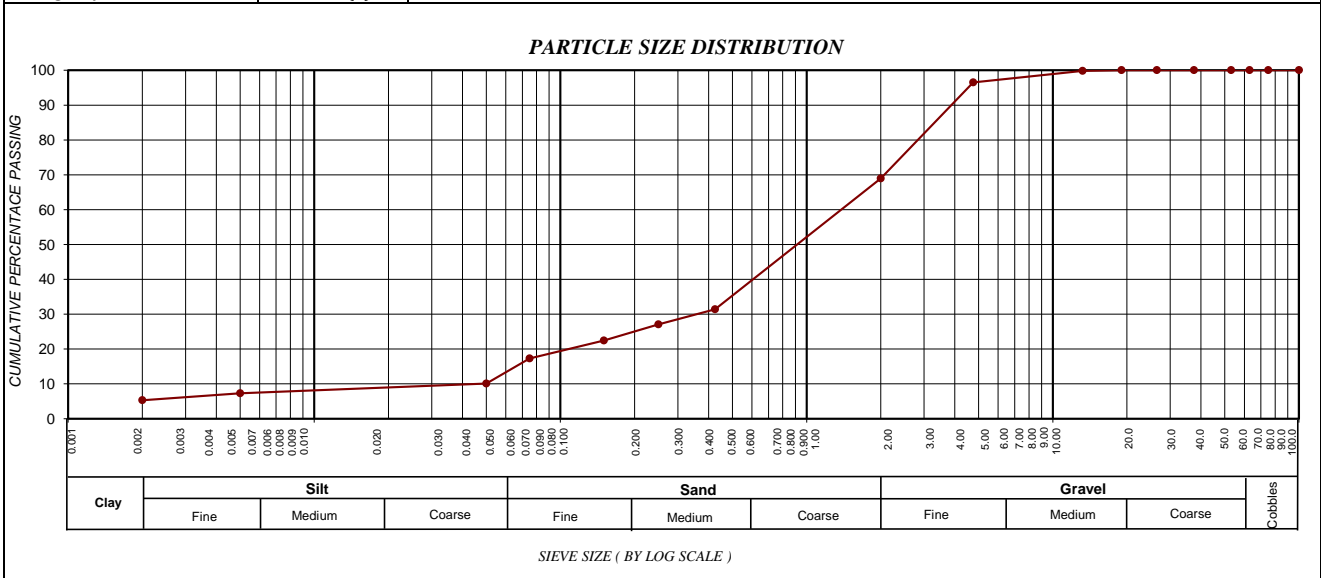
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OUR REF : 92/NKA001-02/0001/21	DATE RECEIVED : 04-May-21
CLIENT : Nkanivo Development Consultants	POSITION : TP18A
PROJECT : Dumphries Township Establishment	LAYER : 0.3-1.1m
	SAMPLE No. : S/8466
	SAMPLE DESCRIPTION : Light Red Orange Gravelly Sand

FOUNDATION INDICATOR - (SANS 3001-GR1, SANS 3001-GR10) & (ASTM Method D422)

Weighted PI	-	Specific Gravity	2.65	
Sieve analysis Cumulative percentage passing (mm)	100.0	100	<div style="display: flex; justify-content: space-around;"> <div style="text-align: center;"> <p>POTENTIAL EXPANSIVENES</p> </div> <div style="text-align: center;"> <p>PLASTICITY CHART</p> </div> </div>	
	75.0	100		
	63.0	100		
	50.0	100		
	37.5	100		
	28.0	100		
	20.0	100		
	14.0	100		
	5.00	96		
	2.000	69		
	0.425	31		
	0.250	27		
	0.150	22		
	0.075	17		
	50 µm	10		
5 µm	7			
2 µm	5.3			
Soil Mortar Analysis % < 2.00mm	2.000 - 0.425	54	<div style="text-align: center;"> <p>PERFORMANCE AS WEARING COURSE</p> </div>	
	0.425 - 0.250	6		
	0.250 - 0.150	7		
	0.150 - 0.075	7		
< 0.075	25			
Effective size		0.048		<div style="text-align: center;"> <p>PARTICLE SIZE DISTRIBUTION</p> </div>
Uniformity Coefficient		33.5		
Curvature Coefficient		1.7		
Oversize Index		0.0		
Shrinkage Product		0		
Grading Coefficient		29.9		
Grading modulus		1.83		
Atterberg Limits	Liquid Limit	-		
	Plasticity Index	NP		
	Linear Shrinkage	-		
	PI < 0.075	NP		
Unified Soil Classification		SM		
U.S. Highway Classification		A-1-b (0)		



CLAY (%) (0.001-0.002)	SILT (%) (0.002-0.060)	SAND (%) (0.060-2.00)	GRAVEL (%) (2.00-60.0)
5.3	7.0	56.7	31.0



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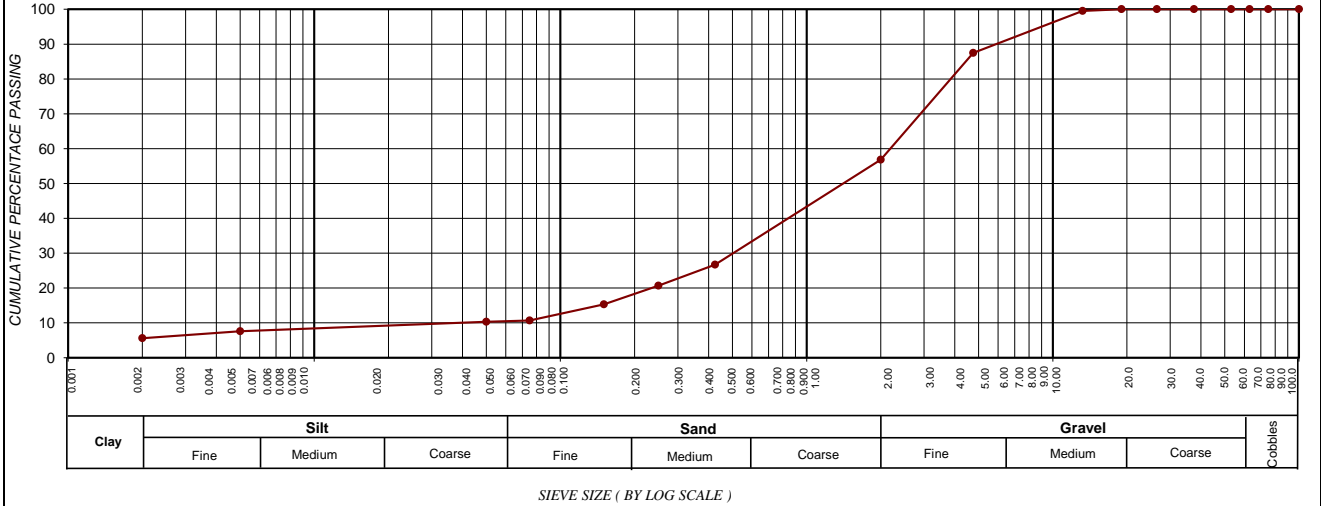
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OUR REF : 92/NKA001-02/0001/21	DATE RECEIVED : 04-May-21
CLIENT : Nkanivo Development Consultants	POSITION : TP19A
PROJECT : Dumphries Township Establishment	LAYER : 0.35-1.5m
	SAMPLE No. : S/8467
	SAMPLE DESCRIPTION : Light Brown Gravelly Sand

FOUNDATION INDICATOR - (SANS 3001-GR1, SANS 3001-GR10) & (ASTM Method D422)

Weighted PI	-	Specific Gravity	2.62	
Sieve analysis Cumulative percentage passing (mm)	100.0	100		
	75.0	100		
	63.0	100		
	50.0	100		
	37.5	100		
	28.0	100		
	20.0	100		
	14.0	100		
	5.00	87		
	2.000	57		
	0.425	27		
	0.250	21		
	0.150	15		
	0.075	11		
	50 µm	10		
5 µm	8			
2 µm	5.6			
Soil Mortar Analysis % < 2.00mm	2.000 - 0.425	53		
	0.425 - 0.250	11		
	0.250 - 0.150	9		
	0.150 - 0.075	8		
< 0.075	19			
Effective size	0.045			
Uniformity Coefficient	51.3			
Curvature Coefficient	3.4			
Oversize Index	0.0			
Shrinkage Product	0			
Grading Coefficient	37.7			
Grading modulus	2.05			
Atterberg Limits	Liquid Limit	-		
	Plasticity Index	NP		
	Linear Shrinkage	-		
	PI < 0.075	6		
Unified Soil Classification	SM			
U.S. Highway Classification	A-1-b (0)			

PARTICLE SIZE DISTRIBUTION



CLAY (%) (0.001-0.002)	SILT (%) (0.002-0.060)	SAND (%) (0.060-2.00)	GRAVEL (%) (2.00-60.0)
5.6	5.0	46.2	43.1



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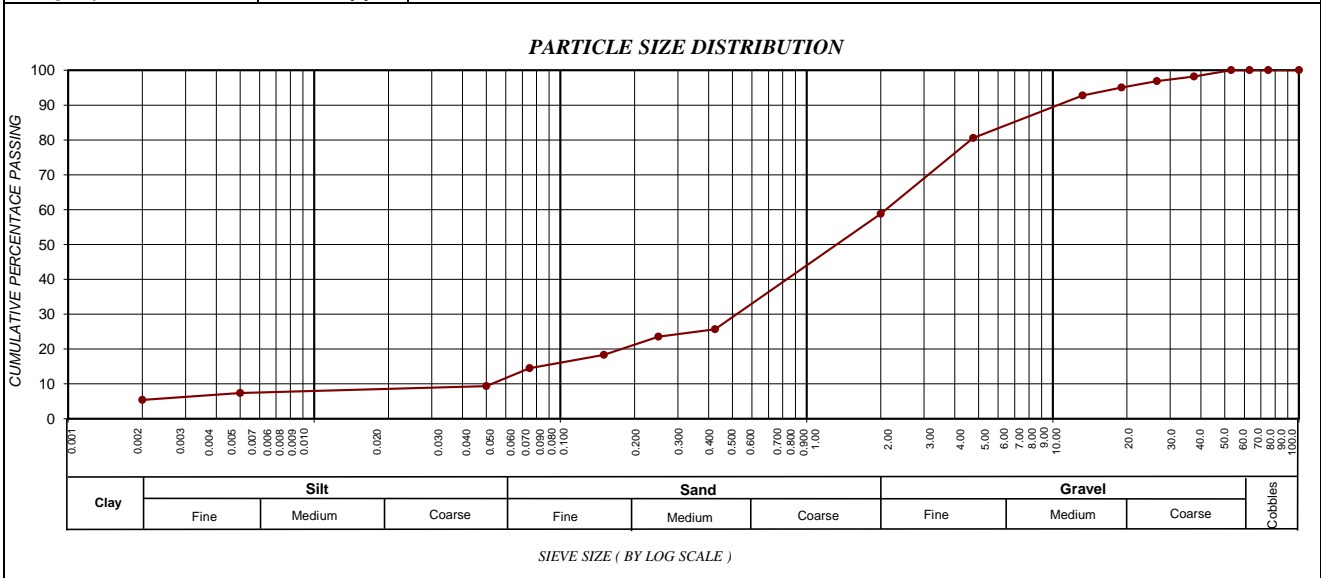
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OUR REF : 92/NKA001-02/0001/21	DATE RECEIVED : 04-May-21
CLIENT : Nkanivo Development Consultants	POSITION : TP20A
PROJECT : Dumphries Township Establishment	LAYER : 0.48-1.98m
	SAMPLE No. : S/8478
	SAMPLE DESCRIPTION : Light Red Orange Gravelly Sand

FOUNDATION INDICATOR - (SANS 3001-GR1, SANS 3001-GR10) & (ASTM Method D422)

Weighted PI	-	Specific Gravity	2.62	
Sieve analysis Cumulative percentage passing (mm)	100.0	100	<div style="display: flex; justify-content: space-around;"> <div style="text-align: center;"> <p>POTENTIAL EXPANSIVENES</p> </div> <div style="text-align: center;"> <p>PLASTICITY CHART</p> </div> </div>	
	75.0	100		
	63.0	100		
	50.0	100		
	37.5	98		
	28.0	97		
	20.0	95		
	14.0	93		
	5.00	81		
	2.000	59		
	0.425	26		
	0.250	24		
	0.150	18		
	0.075	15		
	50 µm	9		
5 µm	7			
2 µm	5.4			
Soil Mortar Analysis % < 2.00mm	2.000 - 0.425	56	<div style="text-align: center;"> <p>PERFORMANCE AS WEARING COURSE</p> </div>	
	0.425 - 0.250	4		
	0.250 - 0.150	9		
	0.150 - 0.075	6		
< 0.075	25			
Effective size		0.053		<div style="text-align: center;"> <p>PARTICLE SIZE DISTRIBUTION</p> </div>
Uniformity Coefficient		40.8		
Curvature Coefficient		3.5		
Over size Index		1.8		
Shrinkage Product		0		
Grading Coefficient		30.7		
Grading modulus		2.01		
Atterberg Limits	Liquid Limit	-		
	Plasticity Index	NP		
	Linear Shrinkage	-		
	PI < 0.075	6		
Unified Soil Classification		SM		
U.S. Highway Classification		A-1-b (0)		



CLAY (%) (0.001-0.002)	SILT (%) (0.002-0.060)	SAND (%) (0.060-2.00)	GRAVEL (%) (2.00-60.0)
5.4	5.7	47.7	41.2



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RG 16732 / COD

Date -

2021/05/24

Nkanivo Development Consultants
 P.O Box 11948
 Silver Lakes
 Pretoria

Attention: Mr. L Mavhetha

Dear Sir

Test Report : **DUMPHRIES TOWNSHIP ESTABLISHMENT - CBR TEST RESULTS (TRACK NO 13081-13082)**

Please find the attached test results for the sample/s as submitted to and tested by Roadlab (PTY)Ltd. In Primrose, Germiston.
 The unambiguous description of the sample/s as received are as follows :

SAMPLE INFORMATION & PROPERTIES				
SAMPLE No.	2021/S8450	2021/S8453	2021/S8455	2021/S8460
CONTAINER USED FOR SAMPLING	Clients Bags	Clients Bags	Clients Bags	Clients Bags
SIZE / WEIGHT OF SAMPLE	±70kg's	±70kg's	±70kg's	±70kg's
MOISTURE CONDITION OF SAMPLE ON ARRIVAL	Slightly Moist	Slightly Moist	Slightly Moist	Slightly Moist
HOLE No. / Km. / CHAINAGE	N/A	N/A	N/A	N/A
ROAD No. OR NAME	TP2A	TP5A	TP7A	TP12A
LAYER TESTED / SAMPLED FROM	0.48-2.2m	0.9-2.2m	0.45-3.0m	0.6-1.8m
DATE SAMPLED	2021/05/04	2021/05/04	2021/05/04	2021/05/04
DATE RECEIVED	2021/05/04	2021/05/04	2021/05/04	2021/05/04
CLIENTS MARKING	None	None	None	None
DESCRIPTION OF SAMPLE (COLOUR & TYPE)	Light Brown Sandy Gravel	Light Brown Sandy Gravel	Light Red Brown Gravelly Sand	Light Red Brown Gravelly Sand
GRADING ANALYSIS - % PASSING SIEVES (SANS : METHOD GR1:2010)				
SIEVE	75.0	100	100	100
	63.0	100	97	100
ANA -	50.0	100	94	100
	37.5	100	88	100
	28.0	100	79	99
	20.0	100	66	96
LYSIS (mm)	14.0	99	62	93
	5.00	94	56	90
	2.00	51	36	57
(SANS GR1:2010)	0.425	23	13	25
	0.075	14	8	13
SANS 3001 - PR5				
Soil Mortar	51	35	71	57
Coarse Sand	55	66	56	56
Fine Sand	18	14	28	19
Coarse Fine Sand	6	6	13	9
Medium Fine Sand	4	3	8	5
Fine Fine Sand	8	6	7	5
Silt & Clay	27	20	15	25
Coarse Sand Ratio	0.5	0.6	0.5	0.5
ATTERBERG LIMITS ANALYSIS (SANS : METHOD GR10 ; GR11)				
ATTERBERG LIMITS (SANS GR10; GR11)	LL%		20.0	
	P.I.	NP	3.0	NP
	LS%		1.5	
	GM	2.13	2.43	1.87
CLASSIFICATION	H.R.B.*	A-1-b(0)	A-1-a(0)	A-1-b(0)
	COLTO*	G6	G7	G7
	T.R.H. 14*	G7	G7	G7
CALIFORNIA BEARING RATIO (SANS : METHOD GR40) / UNCONFINED COMPRESSIVE STRENGTH (SANS : METHOD GR53) (ITS GR54)				
MOD AASHTO (SANS GR30)	OMC%	5.5	4.8	5.2
	MDD(KG/M ³)	2024	2081	2037
	COMP MC %	5.5	4.6	5.1
	% SWELL	0.10	0.09	0.07
C.B.R. (SANS GR40)	100%	55	56	55
	98%	41	37	42
	97%	35	29	35
U.C.S. (SANS GR53)	95%	26	21	24
	93%	20	15	18
	90%	13	11	15
MPA				10
MOD ITS : DRY (kPa) (GR54)		N/A	N/A	N/A
ITS @ 95% : DRY (kPa)		N/A	N/A	N/A
STABILISED WITH	IN LAB			
	ON SITE	Neat	Neat	Neat
TEST TYPE	CBR / FOUND IND	CBR / FOUND IND	CBR / FOUND IND	CBR / FOUND IND
SAMPLED BY	Client	Client	Client	Client
DELIVERED BY	Client	Client	Client	Client
SAMPLING METHOD	TMH5 - MB1	TMH5 - MB1	TMH5 - MB1	TMH5 - MB1
ENVIRONMENTAL CONDITION WHEN SAMPLED	Hot	Hot	Hot	Hot
REMARKS & NOTES	None	None	None	None

Kind Regards

Mr. N Herbst / Mr R Potgieter
 TECHNICAL SIGNATORY / MANAGER

Remarks :

*Opinions & Interpretations are not included in our schedule of Accreditation
 SANAS Accredited Laboratory No. T 0296
 The samples were subjected to analysis according to SANS 3001
 The results reported relate only to the sample tested
 Further use of the above information is not the responsibility or liability of Roadlab
 Documents may only be reproduced or published in their full context
 Compiled By : Linda van Niekerk



Roadlab Laboratories Pty Ltd

- Materials Testing
- Geotechnical & Road Investigations
- Mobile Lab Services
- Specialised Concrete & Forensic Investigations

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 Germiston, JHB, 1400

92/NKA001-02/0001/21

RG 16732 / COD

Date -

2021/05/24

Nkanivo Development Consultants
 P.O Box 11948
 Silver Lakes
 Pretoria

Attention: Mr. L Mavhetha

Dear Sir

Test Report : **DUMPHRIES TOWNSHIP ESTABLISHMENT - CBR TEST RESULTS (TRACK NO 13081-13082)**

Please find the attached test results for the sample/s as submitted to and tested by Roadlab (PTY)Ltd. In Primrose, Germiston.
 The unambiguous description of the sample/s as received are as follows :

SAMPLE INFORMATION & PROPERTIES			
SAMPLE No.	2021/S8467		
CONTAINER USED FOR SAMPLING	Clients Bags		
SIZE / WEIGHT OF SAMPLE	±70kg's		
MOISTURE CONDITION OF SAMPLE ON ARRIVAL	Slightly Moist		
HOLE No. / Km. / CHAINAGE	N/A		
ROAD No. OR NAME	TP19A		
LAYER TESTED / SAMPLED FROM	0.35-1.5m		
DATE SAMPLED	2021/05/04		
DATE RECEIVED	2021/05/04		
CLIENTS MARKING	None		
DESCRIPTION OF SAMPLE (COLOUR & TYPE)	Light Brown Gravelly Sand		
GRADING ANALYSIS - % PASSING SIEVES (SANS : METHOD GR1:2010)			
SIEVE	75.0	100	
	63.0	100	
	50.0	100	
	37.5	100	
	28.0	100	
ANA -	20.0	100	
	14.0	100	
	5.00	87	
LYSIS (mm)	2.00	57	
	0.425	27	
	0.075	11	
SANS 3001 - PR5			
Soil Mortar	57		
Coarse Sand	53		
Fine Sand	28		
Coarse Fine Sand	11		
Medium Fine Sand	11		
Fine Fine Sand	7		
Silt & Clay	19		
Coarse Sand Ratio	0.5		
ATTERBERG LIMITS ANALYSIS (SANS : METHOD GR10 ; GR11)			
ATTERBERG LIMITS (SANS GR10; GR11)	LL%		
	P.I.	NP	
	LS%		
GM	2.05		
CLASSIFICATION	H.R.B.*	A-1-b(0)	
	COLTO*	G6	
	T.R.H. 14*	G7	
CALIFORNIA BEARING RATIO (SANS : METHOD GR40) / UNCONFINED COMPRESSIVE STRENGTH (SANS : METHOD GR53) (ITS GR54)			
MOD AASHTO (SANS GR30)	OMC%	4.8	
	MDD(KG/M ³)	2103	
	COMP MC %	4.7	
C.B.R. (SANS GR40)	% SWELL	0.08	
	100%	73	
	98%	50	
U.C.S. (SANS GR53)	97%	41	
	95%	28	
	93%	19	
MPA	11		
MOD ITS : DRY (kPa) (GR54)	N/A		
ITS @ 95% : DRY (kPa)	N/A		
STABILISED WITH	IN LAB		
	ON SITE	Neat	
TEST TYPE	CBR / FOUND IND		
SAMPLED BY	Client		
DELIVERED BY	Client		
SAMPLING METHOD	TMH5 - MB1		
ENVIRONMENTAL CONDITION WHEN SAMPLED	Hot		
REMARKS & NOTES	None		

Kind Regards


 Mr. N Herbst / Mr R Potgieter
 TECHNICAL SIGNATORY / MANAGER

Remarks :

*Opinions & Interpretations are not included in our schedule of Accreditation
 SANAS Accredited Laboratory No. T 0296
 The samples were subjected to analysis according to SANS 3001
 The results reported relate only to the sample tested
 Further use of the above information is not the responsibility or liability of Roadlab
 Documents may only be reproduced or published in their full context
 Compiled By : Linda van Niekerk

Client :	NKANIVO DEVELOPMENT CONSULTANTS (COO		
Address :	P O BOX 11948	Client Reference :	
	SILVER LAKES	Order No. :	Samuel
	54		
Attention :		Date Received :	17/11/2020
Facsimile :		Date Tested :	17/11/2020 - 03/12/2020
E-mail :	info@nkanivo.co.za	Date Reported :	04/12/2020
Project :	Dumphiries (Newington 255KU)		
Project No. :	2020-B-1505	Report Status :	Final
		Page :	1 of 14

Herewith please find the test report(s) pertaining to the above project. All tests were conducted in accordance with prescribed test method(s). Information herein consists of the following:

Test(s) conducted / Item(s) measured	Qty.	Test Method(s)	Authorized By**	Page(s)
Moisture Density Relationship	3.000	SANS 3001 GR30	S Pullen	10-12
pH of Soil *	2.000	TMH1 A20	J Marques	2-3
Conductivity of saturated soil paste *	2.000	TMH1 A21T	J Marques	2-3
Atterberg Limits <0.425mm	12.000	SANS 3001 GR10	S Pullen	4-9, 13-14
Sieve Analysis 0.075mm	12.000	SANS 3001 GR1	S Pullen/B Mvubu	4-9, 13-14
California Bearing Ratio (CBR)	3.000	SANS 3001 GR40	S Pullen	13-14

Any test results contained in this report and marked with * in the table above are "not SANAS accredited" and are not included in the schedule of accreditation for this laboratory.

Any information contained in this test report pertain only to the areas and/or samples tested. Documents may only be reproduced or published in their full context.

While every care is taken to ensure that all tests are carried out in accordance with recognised standards, neither Civilab (Proprietary) Limited nor its employess shall be liable in any way whatsoever for any error made in the execution or reporting of tests or any erroneous conclusions drawn therefrom or for any consequences thereof.

All interpretations, Interpolations, Opinions and/or Classifications contained in this report falls outside our scope of accreditation.

The following parameters, where applicable, were excluded from the classification procedure: Chemical modifications, Additional fines, Fractured Faces, Soluble Salts, pH, Conductivity, Coarse Sand Ratio, Durability (COLTO: G4-G9).

The following parameters, where applicable, were assumed: Rock types were assumed to be of an Arenaceous nature with Siliceous cementing material.

Unless otherwise requested or stated, all samples will be discarded after a period of 3 months.

This report is completely confidential between the parties (Civilab and Civilab's client) and shall not be disclosed to anybody else, unless agreed upon in writing or made publicly available by the client or required to make available by law.

Deviations in Test Methods:

Technical Signatory:	
Signature:	

**All results are authorized electronically by approved managers and/or technical signatories.

Client :	NKANIVO DEVELOPMENT CONSULTANTS (COO	Date Received:	17/11/2020
Project :	Dumphiries (Newington 255KU)	Date Reported:	04/12/2020
Project No :	2020-B-1505	Page No. :	2 of 14

AGGREGATE TEST REPORT

Laboratory Number	3		
Field Number	TP2		
Client Reference			
Depth (m)	0.47-1.20		
Position			
Coordinates	X		
	Y		
Description			
Additional Information			
Calcrete/Crushed			
Stabilizing Agent			

Test	Units	Result	Remarks	Finess Modulus		SANS 3001 GR3	%	1
				mm	mm			
% Passing		mm		Clay Content				
		mm		Organic Impurities			Ref.	
		mm		Flakiness Index	Total			
		mm						%
		mm		Average Least Dimension	Manual			
		mm			Machine			mm
		mm			Computation			
		mm		Aggregate Crushing Value	Dry			
		mm			Wet			%
		mm			Eth. Glycol			
		mm		10% Fines Aggregate Crushing Test (FACT)	Dry			
		mm			Wet			kN
		mm			Eth. Glycol			
		mm		Bulk Density	Wet/Dry Ratio			%
		mm			Loose			kg/m ³
		mm			Compacted			
		mm		Water Absorption				%
Sand Equivalent, Se								
pH		6.7						
Relative Density of Soils				Bulk Particle Density				kg/m ³
Durability Mill Index					Aggregate			
Moisture Content		%		Apparent Particle Density				kg/m ³
Compactibility Factor								
Conductivity		S.m ⁻¹	0.017					
Total Water Soluble	Salts			Adjusted Relative				
	Sulphates	%						
Soluble	Salts	%		LA Abrasion	1000 Revs			%
	Sulphates	%			500 Revs			
Soundness	Fine	%		Riedel & Weber				
	Coarse			Akali Silica Reaction			%	
	Fractions	No.		Drying Shrinkage			%	
Methylene Blue Absorption				Wetting Expansion			%	
Soluble Deleterious Impurities		%		Fractured Faces			%	
Chloride Content		%		Coarse Sand Ratio			%	
Low Density Material		%		Shape: Voids			%	
Presence of Sugar				Shell Content			%	
Mill Abrasion				Durability	Ballast			
Treton Value				Eth. Glycol Durability on	Concrete			
Vialit Adhesion @	5°C	%			Crushed			
	25°C	%			_ Stone	Seal		

Client :	NKANIVO DEVELOPMENT CONSULTANTS (COO	Date Received:	17/11/2020
Project :	Dumphiries (Newington 255KU)	Date Reported:	04/12/2020
Project No :	2020-B-1505	Page No. :	3 of 14

AGGREGATE TEST REPORT

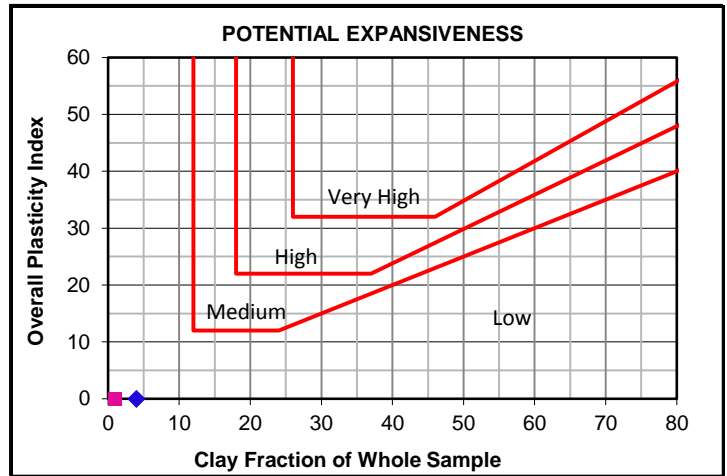
Laboratory Number	11		
Field Number	TP17		
Client Reference			
Depth (m)	035-1.50		
Position			
Coordinates	X		
	Y		
Description			
Additional Information			
Calcrete/Crushed			
Stabilizing Agent			

		mm		Finess Modulus		SANS 3001 GR3	%	3
		mm		Clay Content				
		mm		Organic Impurities			Ref.	
		mm		Flakiness Index	Total		%	
		mm						
		mm		Average Least Dimension	Manual		mm	
		mm			Machine			
		mm			Computation			
		mm		Aggregate Crushing Value	Dry		%	
		mm			Wet			
		mm			Eth. Glycol			
		mm		10% Fines Aggregate Crushing Test (FACT)	Dry		kN	
		mm			Wet			
		mm			Eth. Glycol			
		mm		Bulk Density	Wet/Dry Ratio		%	
		mm			Loose			
		mm		Water Absorption	Compacted		kg/m ³	
		mm						
Sand Equivalent, Se							%	
pH			6					
Relative Density of Soils				Bulk Particle Density			kg/m ³	
Durability Mill Index					Aggregate			
Moisture Content		%		Apparent Particle Density			kg/m ³	
Compactibility Factor								
Conductivity		S.m ⁻¹	0.007					
Total Water Soluble	Salts	%		Adjusted Relative				
	Sulphates	%						
Soluble	Salts	%		LA Abrasion	1000 Revs		%	
	Sulphates	%			500 Revs			
Soundness	Fine	%		Riedel & Weber				
	Coarse	No.		Akali Silica Reaction			%	
	Fractions			Drying Shrinkage			%	
Methylene Blue Absorption				Wetting Expansion			%	
Soluble Deleterious Impurities		%		Fractured Faces			%	
Chloride Content		%		Coarse Sand Ratio			%	
Low Density Material		%		Shape: Voids			%	
Presence of Sugar				Shell Content			%	
Mill Abrasion				Durability	Ballast			
Treton Value				Eth. Glycol Durability on	Concrete			
Vialit Adhesion @	5°C	%			Crushed			
	25°C	%		_ Stone	Seal			

Client :	NKANIVO DEVELOPMENT CONSULTANTS (COO	Date Received:	17/11/2020
Project :	Dumphries (Newington 255KU)	Date Reported:	04/12/2020
Project No :	2020-B-1505	Page No. :	4 of 14

FOUNDATION INDICATOR

Laboratory Number	1 ◆	2 ■
Field Number	TP1	TP1
Client Reference		
Depth (m)	0.40-1.60	1.60-2.30
Position		
Coordinates	X	
	Y	
Description		
Additional Information		
Calcrete / Crushed Stabilizing Agent		

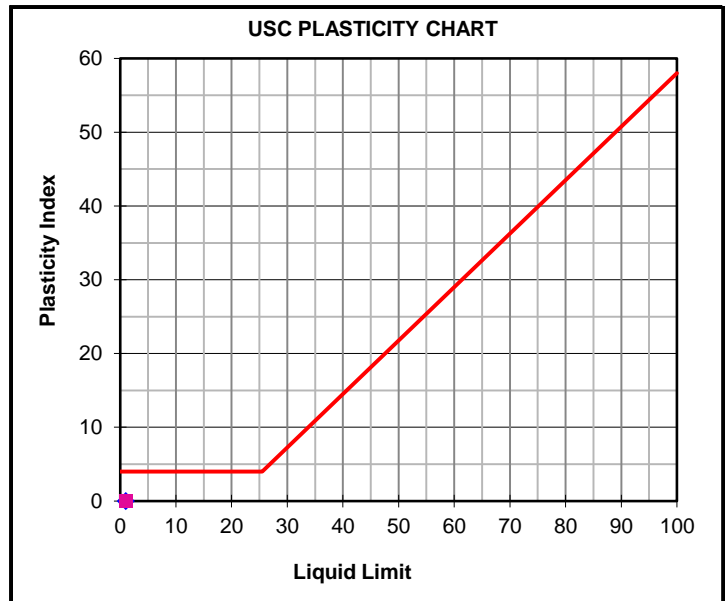


Moisture Content & Relative Density

Moisture Content (%)		
Relative Density (S.G.)		

Sieve Analysis (Wet Prep) SANS 3001 GR1

Percentage Passing	100 mm	100	100
	75 mm	100	100
	63 mm	100	100
	50 mm	100	100
	37.5 mm	100	100
	28 mm	100	100
	20 mm	100	100
	14 mm	100	100
	5 mm	98	94
	2 mm	88	59
	1 mm	65	32
	0.425 mm	41	17
	0.250 mm	32	12
	0.150 mm	25	9
0.075 mm	18	7	
Grading Modulus	1.53	2.17	



Hydrometer Analysis SANS 3001 GR3

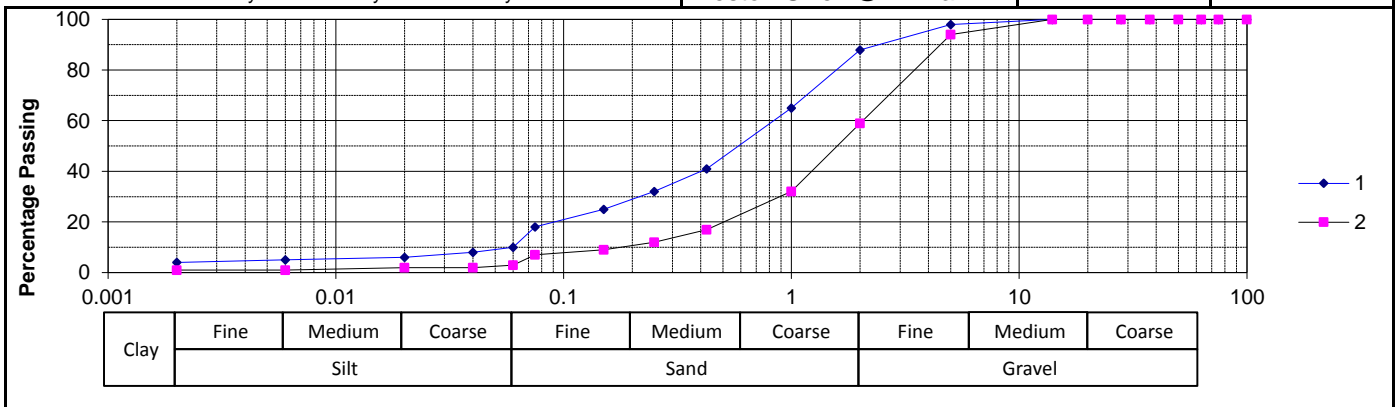
Percentage Passing	0.060 mm	10	3
	0.040 mm	8	2
	0.020 mm	6	2
	0.006 mm	5	1
	0.002 mm	4	1
Gravel	%	12	41
Sand	%	78	56
Silt	%	6	2
Clay	%	4	1

Laboratory Number	1 ◆	2 ■
Atterberg Limits -425µ SANS 3001 GR10		
Liquid Limit	%	
Plasticity Index	%	SP
Linear Shrinkage	%	1.0
Overall PI	%	0.5

Classifications

HRB (AASHTO)	A-1-b(0)	A-1-b(0)
Unified (ASTM D2487)	SM	SW-SM
Weston Swell @ 1 kPa		

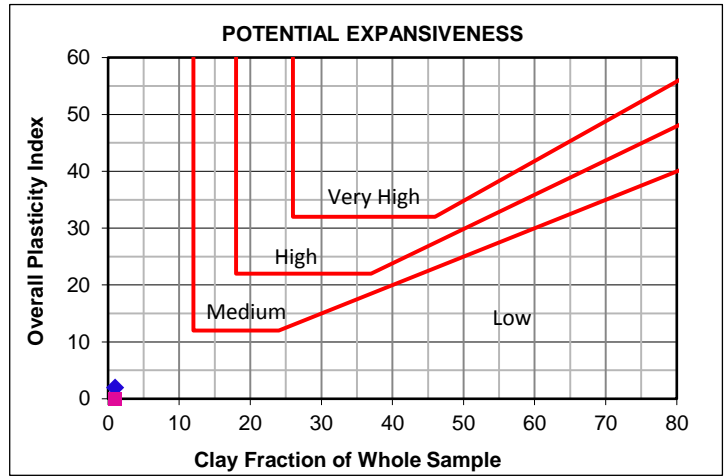
Note: An assumed S.G. may be used in Hydrometer Analysis calculations



Client :	NKANIVO DEVELOPMENT CONSULTANTS (COO	Date Received:	17/11/2020
Project :	Dumphries (Newington 255KU)	Date Reported:	04/12/2020
Project No :	2020-B-1505	Page No. :	5 of 14

FOUNDATION INDICATOR

Laboratory Number	3 ◆	4 ■
Field Number	TP2	TP3
Client Reference		
Depth (m)	0.47-1.20	0.30-0.70
Position		
Coordinates	X	
	Y	
Description		
Additional Information		
Calcrete / Crushed Stabilizing Agent		

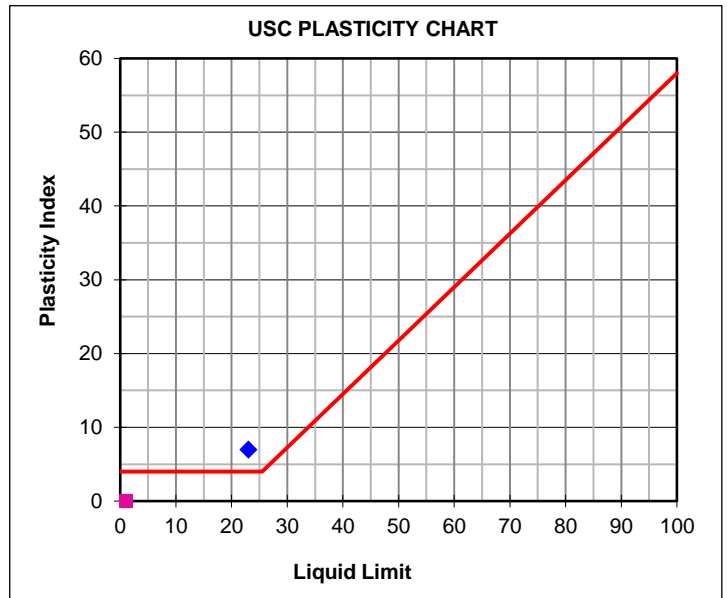


Moisture Content & Relative Density SANS 3001 GR30

Moisture Content (%)		
Relative Density (S.G.)		

Sieve Analysis (Wet Prep) SANS 3001 GR1

Percentage Passing	100 mm	100	100
	75 mm	100	100
	63 mm	100	100
	50 mm	100	100
	37.5 mm	100	100
	28 mm	100	100
	20 mm	100	100
	14 mm	100	100
	5 mm	93	91
	2 mm	63	60
	1 mm	40	36
	0.425 mm	24	18
	0.250 mm	19	12
	0.150 mm	14	8
0.075 mm	11	6	
Grading Modulus	2.02	2.16	



Hydrometer Analysis SANS 3001 GR3

Percentage Passing	0.060 mm	6	2
	0.040 mm	5	2
	0.020 mm	4	2
	0.006 mm	3	1
	0.002 mm	1	1
Gravel	%	37	40
Sand	%	57	58
Silt	%	5	1
Clay	%	1	1

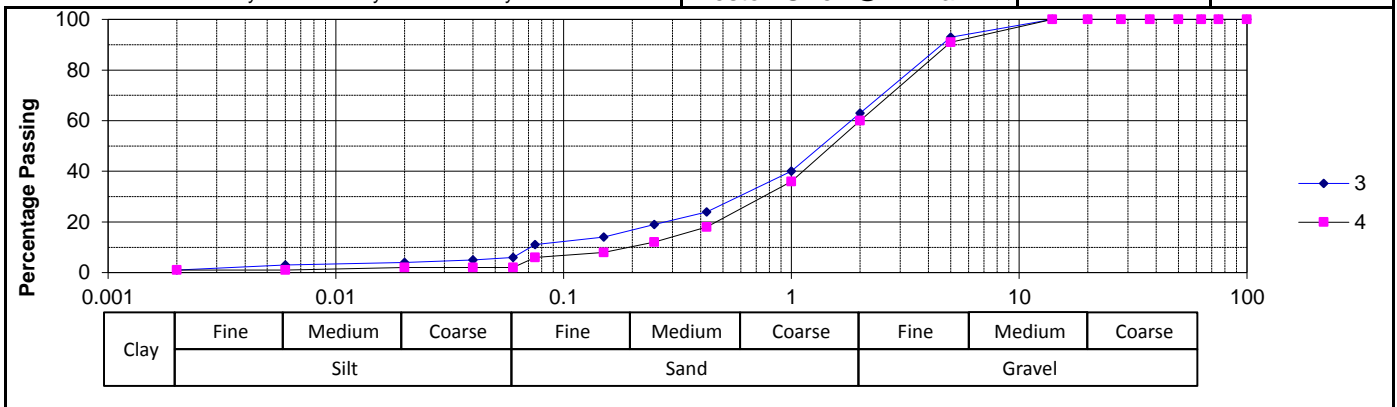
Laboratory Number	3 ◆	4 ■
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Atterberg Limits -425µ SANS 3001 GR10	
Liquid Limit	% 23
Plasticity Index	% 7
Linear Shrinkage	% 3.0
Overall PI	% 2

Classifications

HRB (AASHTO)	A-2-4(0)	A-1-b(0)
Unified (ASTM D2487)	SW-SC	SW-SM
Weston Swell @ 1 kPa		

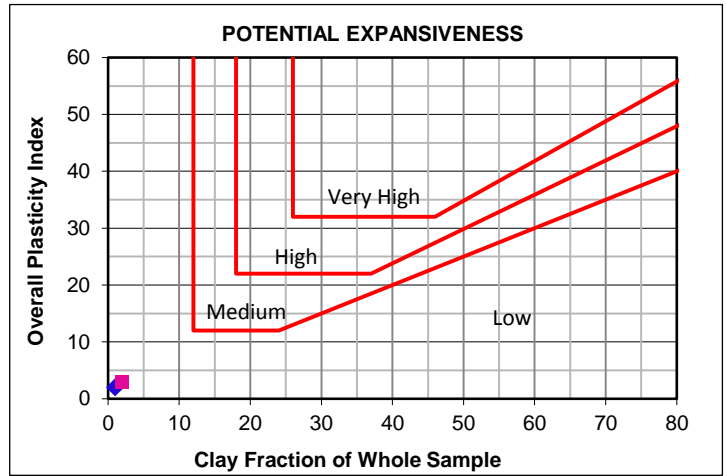
Note: An assumed S.G. may be used in Hydrometer Analysis calculations



Client :	NKANIVO DEVELOPMENT CONSULTANTS (COO	Date Received:	17/11/2020
Project :	Dumphries (Newington 255KU)	Date Reported:	04/12/2020
Project No :	2020-B-1505	Page No. :	6 of 14

FOUNDATION INDICATOR

Laboratory Number	5 ◆	6 ■
Field Number	TP5	TP7
Client Reference		
Depth (m)	0.40-1.00	0.45-1.20
Position		
Coordinates	X	
	Y	
Description		
Additional Information		
Calcrete / Crushed Stabilizing Agent		

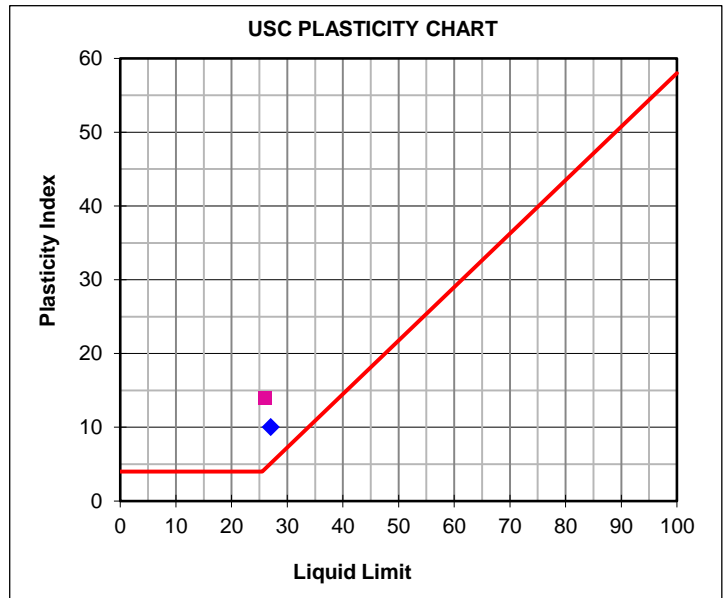


Moisture Content & Relative Density

Moisture Content (%)		
Relative Density (S.G.)		

Sieve Analysis (Wet Prep) SANS 3001 GR1

Percentage Passing	100 mm	100	100
	75 mm	100	100
	63 mm	100	100
	50 mm	100	100
	37.5 mm	100	100
	28 mm	100	100
	20 mm	100	100
	14 mm	98	88
	5 mm	87	70
	2 mm	50	45
	1 mm	29	29
	0.425 mm	17	19
	0.250 mm	14	15
	0.150 mm	11	12
0.075 mm	9	9	
Grading Modulus	2.24	2.27	



Hydrometer Analysis SANS 3001 GR3

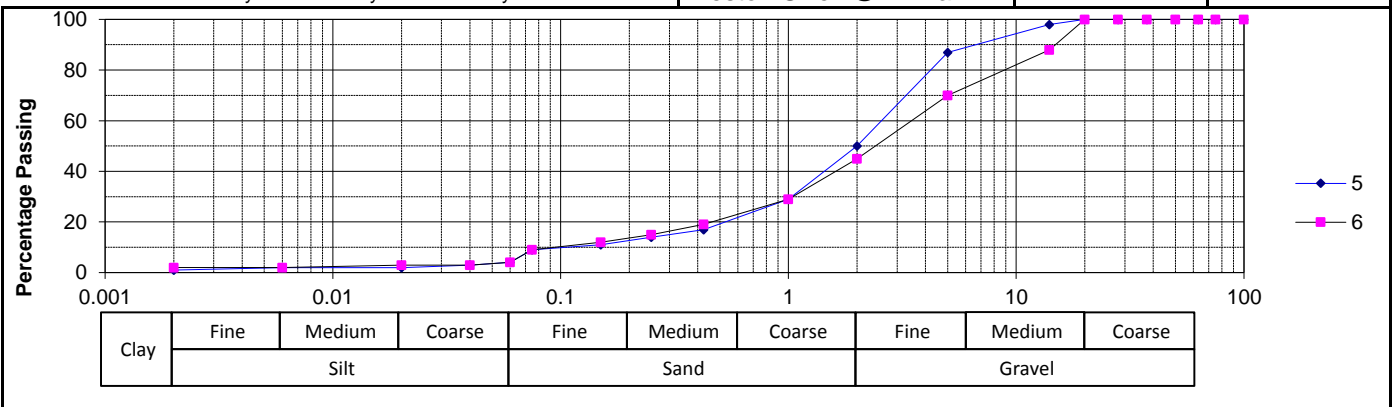
Percentage Passing	0.060 mm	4	4
	0.040 mm	3	3
	0.020 mm	2	3
	0.006 mm	2	2
	0.002 mm	1	2
Gravel	%	50	55
Sand	%	46	41
Silt	%	3	2
Clay	%	1	2

Laboratory Number	5 ◆	6 ■	
Atterberg Limits -425µ SANS 3001 GR10			
Liquid Limit	%	27	26
Plasticity Index	%	10	14
Linear Shrinkage	%	4.5	5.0
Overall PI	%	2	3

Classifications

HRB (AASHTO)	A-2-4(0)	A-2-6(0)
Unified (ASTM D2487)	SP-SC	SP-SC
Weston Swell @ 1 kPa		

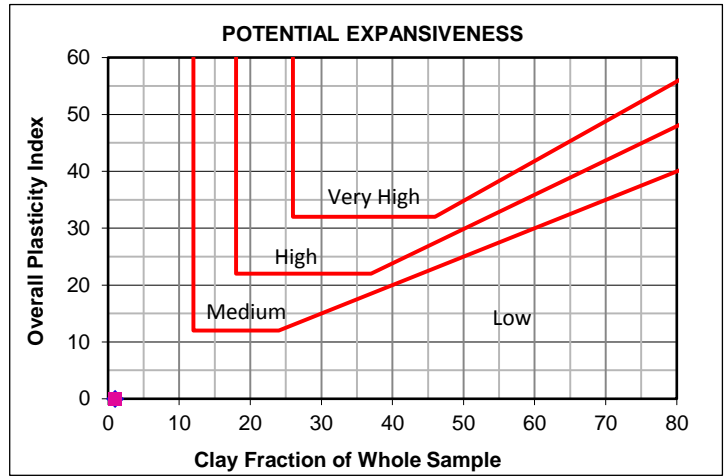
Note: An assumed S.G. may be used in Hydrometer Analysis calculations



Client :	NKANIVO DEVELOPMENT CONSULTANTS (COO	Date Received:	17/11/2020
Project :	Dumphries (Newington 255KU)	Date Reported:	04/12/2020
Project No :	2020-B-1505	Page No. :	7 of 14

FOUNDATION INDICATOR

Laboratory Number	7 ◆	8 ■
Field Number	TP10	TP12
Client Reference		
Depth (m)	0.35-1.00	0.60-1.50
Position		
Coordinates	X Y	
Description		
Additional Information		
Calcrete / Crushed Stabilizing Agent		

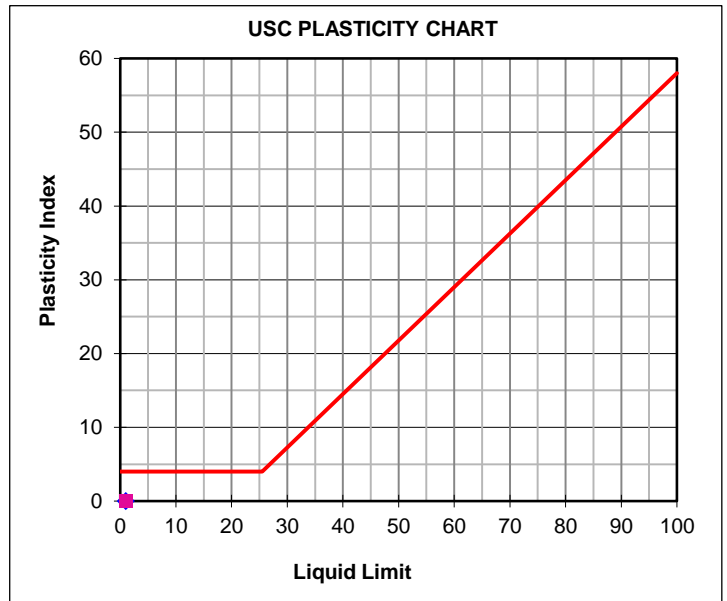


Moisture Content & Relative Density SANS 3001 GR30

Moisture Content (%)		
Relative Density (S.G.)		

Sieve Analysis (Wet Prep) SANS 3001 GR1

Percentage Passing	100 mm	100	100
	75 mm	100	100
	63 mm	100	100
	50 mm	100	100
	37.5 mm	100	100
	28 mm	100	100
	20 mm	100	100
	14 mm	99	100
	5 mm	88	100
	2 mm	67	93
	1 mm	49	68
	0.425 mm	32	39
	0.250 mm	23	27
	0.150 mm	16	19
0.075 mm	11	13	
Grading Modulus	1.90	1.55	



Hydrometer Analysis SANS 3001 GR3

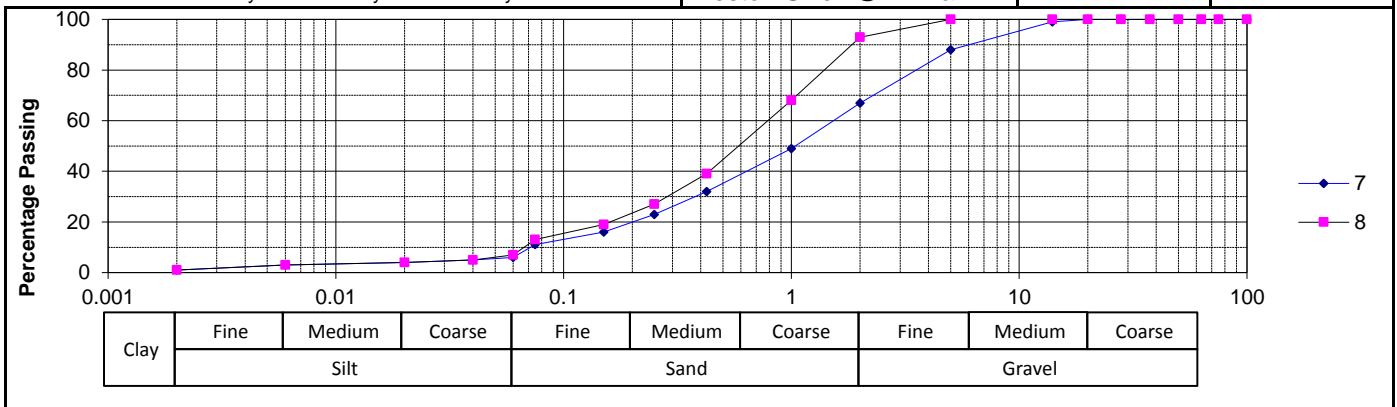
Percentage Passing	0.060 mm	6	7
	0.040 mm	5	5
	0.020 mm	4	4
	0.006 mm	3	3
	0.002 mm	1	1
Gravel	%	33	7
Sand	%	61	86
Silt	%	5	6
Clay	%	1	1

Laboratory Number	7 ◆	8 ■
Atterberg Limits -425µ SANS 3001 GR10		
Liquid Limit	%	
Plasticity Index	%	NP
Linear Shrinkage	%	
Overall PI	%	

Classifications

HRB (AASHTO)	A-1-b(0)	A-1-b(0)
Unified (ASTM D2487)	SW-SM	SM
Weston Swell @ 1 kPa		

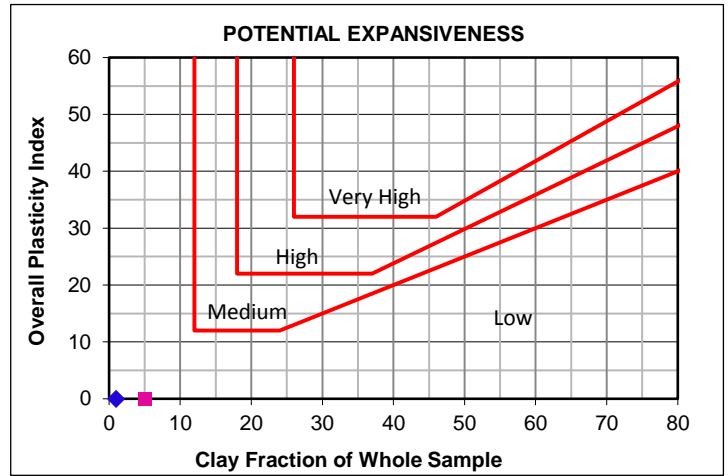
Note: An assumed S.G. may be used in Hydrometer Analysis calculations



Client :	NKANIVO DEVELOPMENT CONSULTANTS (COO	Date Received:	17/11/2020
Project :	Dumphries (Newington 255KU)	Date Reported:	04/12/2020
Project No :	2020-B-1505	Page No. :	8 of 14

FOUNDATION INDICATOR

Laboratory Number	9 ◆	10 ■
Field Number	TP14	TP16
Client Reference		
Depth (m)	0.42-1.25	0.54-1.20
Position		
Coordinates	X	
	Y	
Description		
Additional Information		
Calcrete / Crushed Stabilizing Agent		

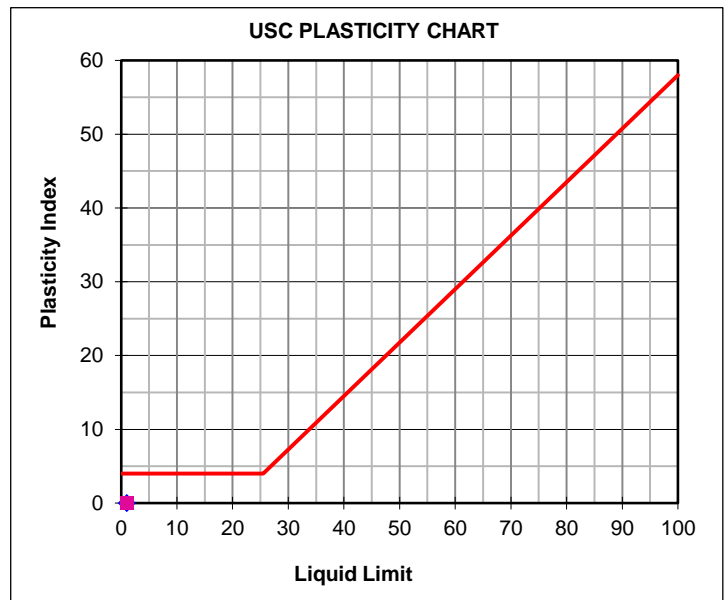


Moisture Content & Relative Density

Moisture Content (%)		
Relative Density (S.G.)		

Sieve Analysis (Wet Prep) SANS 3001 GR1

Percentage Passing	100 mm	100	100
	75 mm	100	100
	63 mm	100	100
	50 mm	100	100
	37.5 mm	100	100
	28 mm	100	100
	20 mm	100	100
	14 mm	96	99
	5 mm	81	92
	2 mm	57	78
	1 mm	40	61
	0.425 mm	26	44
	0.250 mm	21	34
	0.150 mm	17	27
0.075 mm	13	20	
Grading Modulus	2.04	1.58	



Hydrometer Analysis SANS 3001 GR3

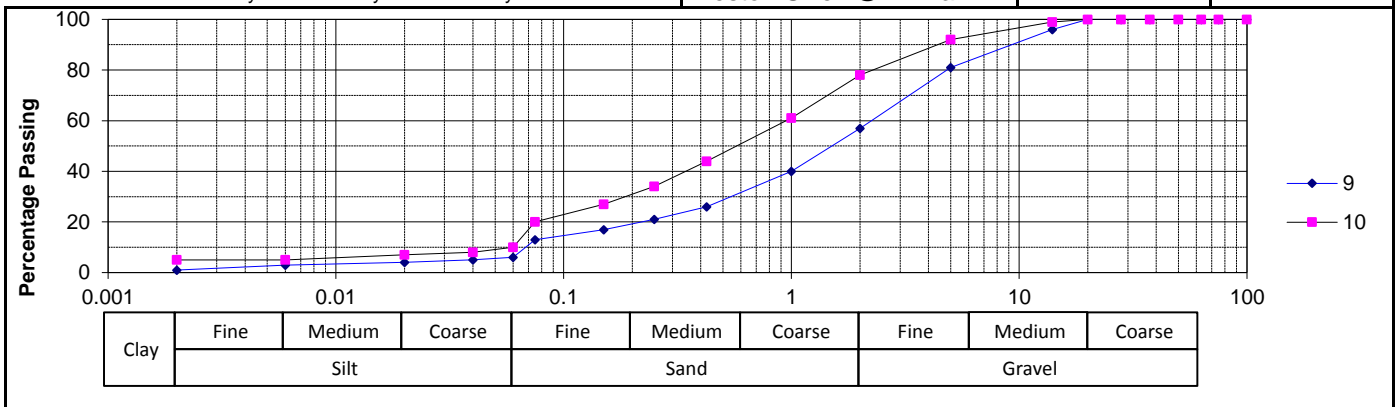
Percentage Passing	0.060 mm	6	10
	0.040 mm	5	8
	0.020 mm	4	7
	0.006 mm	3	5
	0.002 mm	1	5
Gravel	%	43	22
Sand	%	51	68
Silt	%	5	5
Clay	%	1	5

Laboratory Number	9 ◆	10 ■
Atterberg Limits -425µ SANS 3001 GR10		
Liquid Limit	%	
Plasticity Index	%	SP NP
Linear Shrinkage	%	1.0
Overall PI	%	

Classifications

HRB (AASHTO)	A-1-b(0)	A-1-b(0)
Unified (ASTM D2487)	SM	SM
Weston Swell @ 1 kPa		

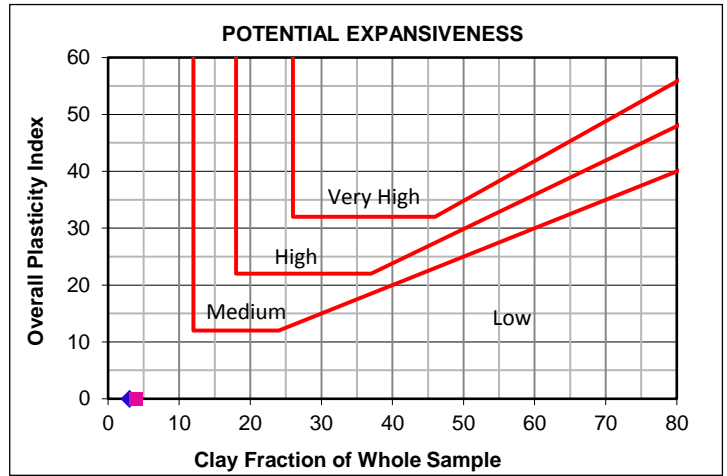
Note: An assumed S.G. may be used in Hydrometer Analysis calculations



Client :	NKANIVO DEVELOPMENT CONSULTANTS (COO	Date Received:	17/11/2020
Project :	Dumphries (Newington 255KU)	Date Reported:	04/12/2020
Project No :	2020-B-1505	Page No. :	9 of 14

FOUNDATION INDICATOR

Laboratory Number	11 ◆	12 ■
Field Number	TP17	TP19
Client Reference		
Depth (m)	035-1.50	0.40-1.00
Position		
Coordinates	X	
	Y	
Description		
Additional Information		
Calcrete / Crushed Stabilizing Agent		

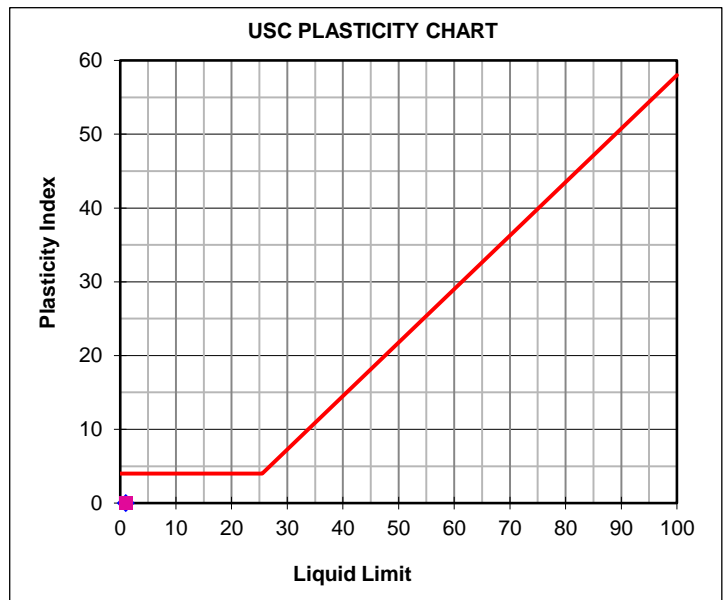


Moisture Content & Relative Density SANS 3001 GR30

Moisture Content (%)		
Relative Density (S.G.)		

Sieve Analysis (Wet Prep) SANS 3001 GR1

Percentage Passing	100 mm	100	100
	75 mm	100	100
	63 mm	100	100
	50 mm	100	100
	37.5 mm	100	100
	28 mm	100	100
	20 mm	100	100
	14 mm	100	99
	5 mm	99	93
	2 mm	88	71
	1 mm	61	54
	0.425 mm	36	39
	0.250 mm	26	33
	0.150 mm	18	26
0.075 mm	12	17	
Grading Modulus	1.64	1.73	



Hydrometer Analysis SANS 3001 GR3

Percentage Passing	0.060 mm	5	11
	0.040 mm	4	9
	0.020 mm	4	8
	0.006 mm	3	6
	0.002 mm	3	4
Gravel	%	12	29
Sand	%	83	60
Silt	%	2	7
Clay	%	3	4

Laboratory Number 11 ◆ 12 ■

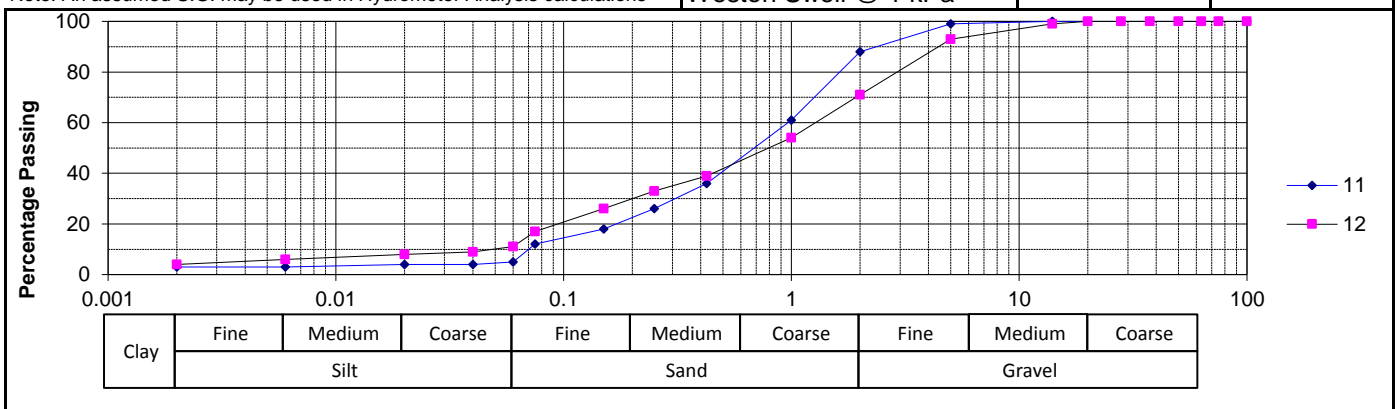
Atterberg Limits -425µ SANS 3001 GR10

Liquid Limit	%		
Plasticity Index	%	NP	NP
Linear Shrinkage	%		
Overall PI	%		

Classifications

HRB (AASHTO)	A-1-b(0)	A-1-b(0)
Unified (ASTM D2487)	SW-SM	SM
Weston Swell @ 1 kPa		

Note: An assumed S.G. may be used in Hydrometer Analysis calculations



Client : NKANIVO DEVELOPMENT CONSULTANTS (COO)
 Project : Dumphries (Newington 255KU)
 Project No: 2020-B-1505

Date Received: 17/11/2020
 Date Reported: 04/12/2020
 Page No. : 10 of 14

MOISTURE DENSITY RELATIONSHIP

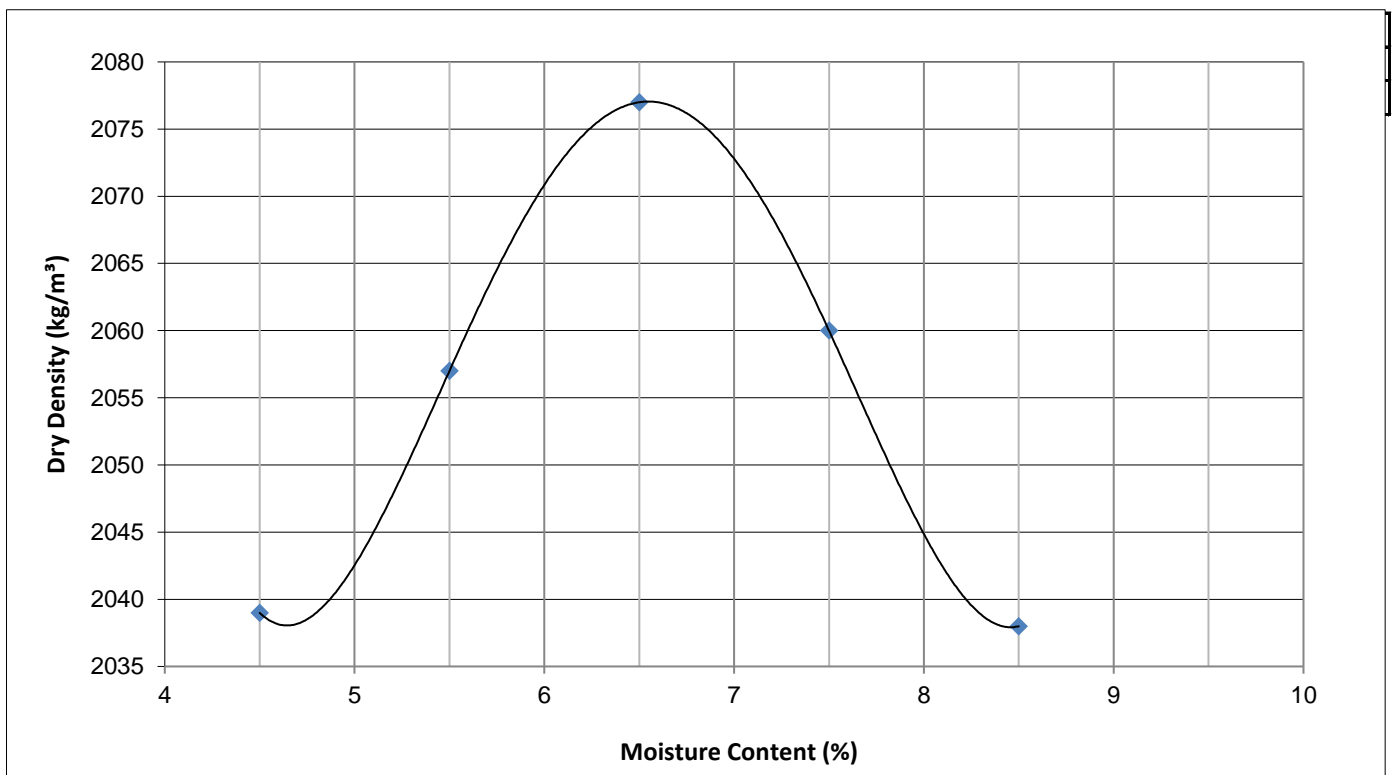
Laboratory Number	3	
Field Number	TP2	
Client Reference		
Depth (m)	0.47-1.20	
Position		
Coordinates	X	
	Y	
Description		
Additional Information		
Calcrete / Crushed		
Stabilizing Agent		

Maximum Dry Density & Optimum Moisture Content - SANS 3001 GR30

Compactive Effort:	Modified AASHTO
--------------------	-----------------

Dry Density	kg/m ³	2039	2057	2077	2060	2038	
Moisture Content	%	4.5	5.5	6.5	7.5	8.5	

Max. Dry Density	kg/m ³	2077
Optimum Moisture	%	6.6



Client : NKANIVO DEVELOPMENT CONSULTANTS (COO

Date Received: 17/11/2020

Project : Dumphries (Newington 255KU)

Date Reported: 04/12/2020

Project No: 2020-B-1505

Page No. : 11 of 14

MOISTURE DENSITY RELATIONSHIP

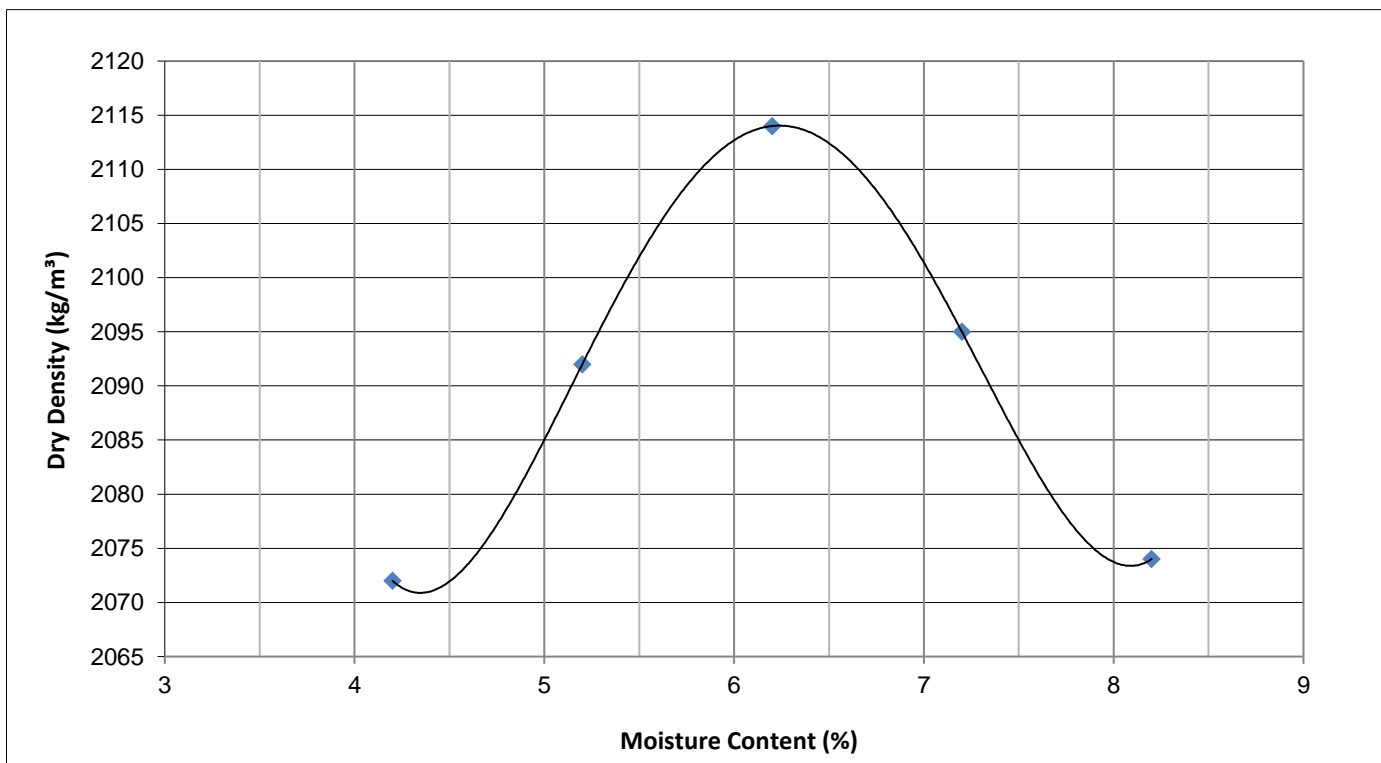
Laboratory Number	7	
Field Number	TP10	
Client Reference		
Depth (m)	0.35-1.00	
Position		
Coordinates	X	
	Y	
Description		
Additional Information		
Calcrete / Crushed Stabilizing Agent		

Maximum Dry Density & Optimum Moisture Content - SANS 3001 GR30

Compactive Effort:	Modified AASHTO
--------------------	-----------------

Dry Density	kg/m ³	2072	2092	2114	2095	2074	
Moisture Content	%	4.2	5.2	6.2	7.2	8.2	

Max. Dry Density	kg/m ³	2114
Optimum Moisture	%	6.2



Client : NKANIVO DEVELOPMENT CONSULTANTS (COO)
 Project : Dumphries (Newington 255KU)
 Project No: 2020-B-1505

Date Received: 17/11/2020
 Date Reported: 04/12/2020
 Page No. : 12 of 14

MOISTURE DENSITY RELATIONSHIP

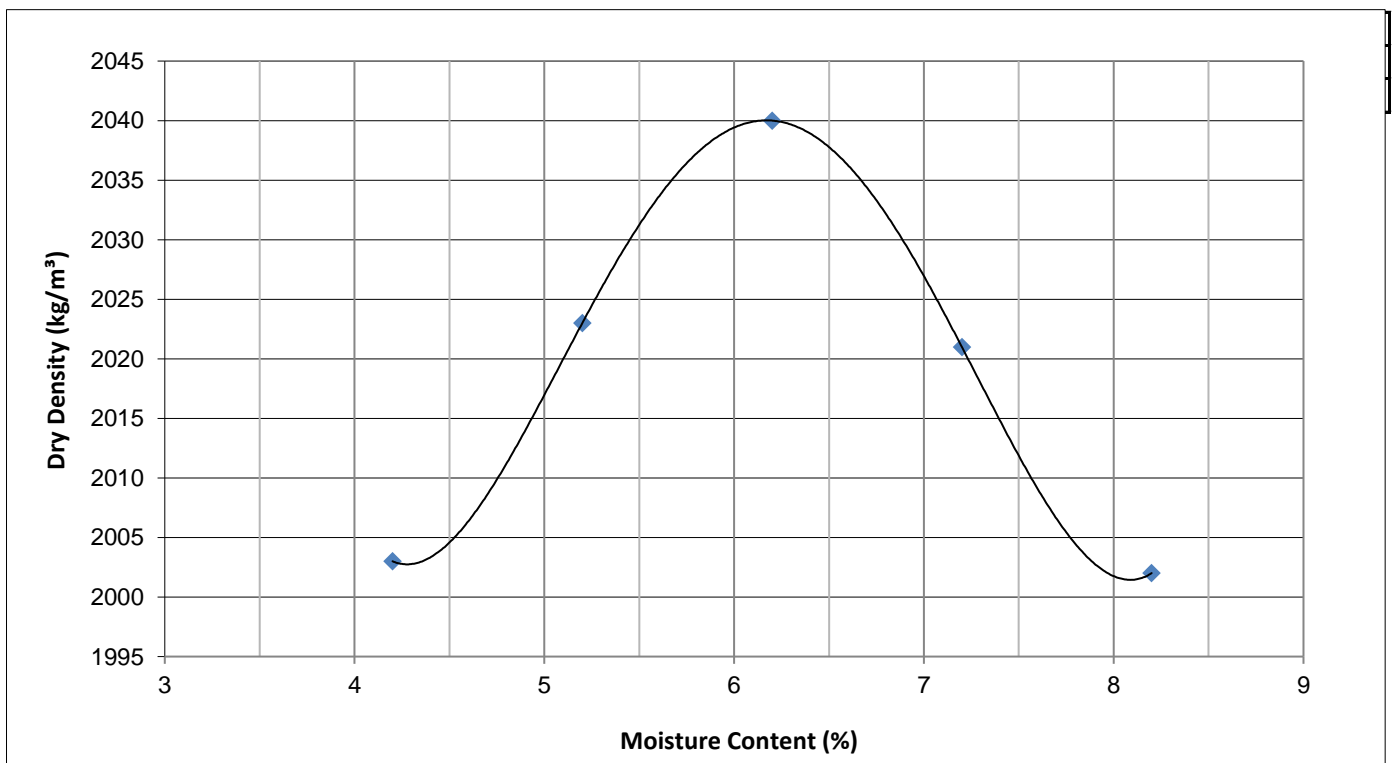
Laboratory Number	11	
Field Number	TP17	
Client Reference		
Depth (m)	035-1.50	
Position		
Coordinates	X	
	Y	
Description		
Additional Information		
Calcrete / Crushed Stabilizing Agent		

Maximum Dry Density & Optimum Moisture Content - SANS 3001 GR30

Compactive Effort:	Modified AASHTO
--------------------	-----------------

Dry Density	kg/m ³	2003	2023	2040	2021	2002	
Moisture Content	%	4.2	5.2	6.2	7.2	8.2	

Max. Dry Density	kg/m ³	2040
Optimum Moisture	%	6.2



Client : NKANIVO DEVELOPMENT CONSULTANTS (COO)
 Project : Dumphiries (Newington 255KU)
 Project No. : 2020-B-1505

Date Received : 17/11/2020
 Date Reported : 04/12/2020
 Page No. : 13 of 14

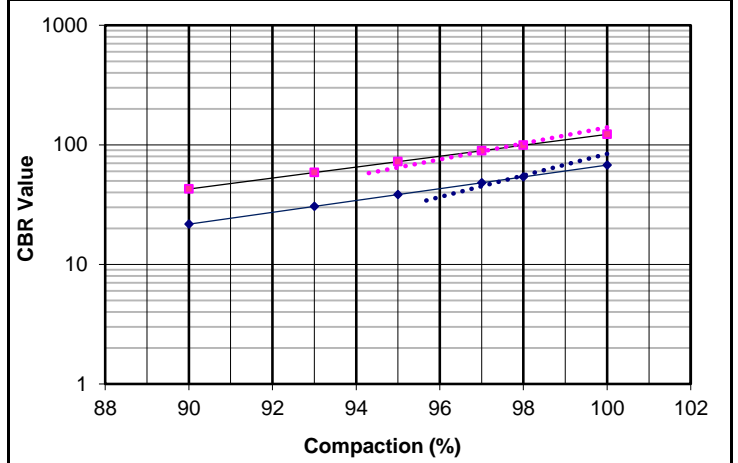
CALIFORNIA BEARING RATIO (CBR) & ROAD INDICATOR REPORT

Laboratory No.	3	7
Field Number	TP2	TP10
Client Reference		
Depth (m)	0.47-1.20	0.35-1.00
Position		
Coordinates	X	
	Y	
Description		
Additional information		
Calcrete/Crushed		
Stabilizing Agent		

Laboratory No.	3	7
Maximum Dry Density & Optimum Moisture Content		SANS 3001 GR30
MDD	kg/m ³	2077
OMC	%	6.6
		2114
		6.2

California Bearing Ratio		SANS 3001 GR40					
Compaction Data							
Moisture	%	6.7			6.2		
Dry Density	kg/m ³	2089	1996	1892	2140	2018	1912
Compaction	%	100.0	95.5	90.6	100.0	94.3	89.3
Penetration Data							
CBR at	2.50 mm	84	33	23	140	58	40
	5.00 mm	105	38	30	164	71	49
	7.50 mm	110	39	33	158	74	53
Swell	%	0	0.1	0.2	0	0.1	0.1
Final Moisture (%)		8.8	11.7	15.2	7.6	12.7	14.2

Sieve Analysis (Wet preparation)		SANS 3001 GR1	
Percentage Passing	100 mm	100	100
	75 mm	100	100
	63 mm	100	100
	50 mm	100	100
	37.5 mm	100	100
	28 mm	100	100
	20 mm	100	100
	14 mm	100	99
	5 mm	93	88
	2 mm	63	67
	1 mm	40	49
	0.425 mm	24	32
	0.250 mm	19	23
	0.150 mm	14	16
0.075 mm	11	11	
Grading Modulus	2.0	1.9	

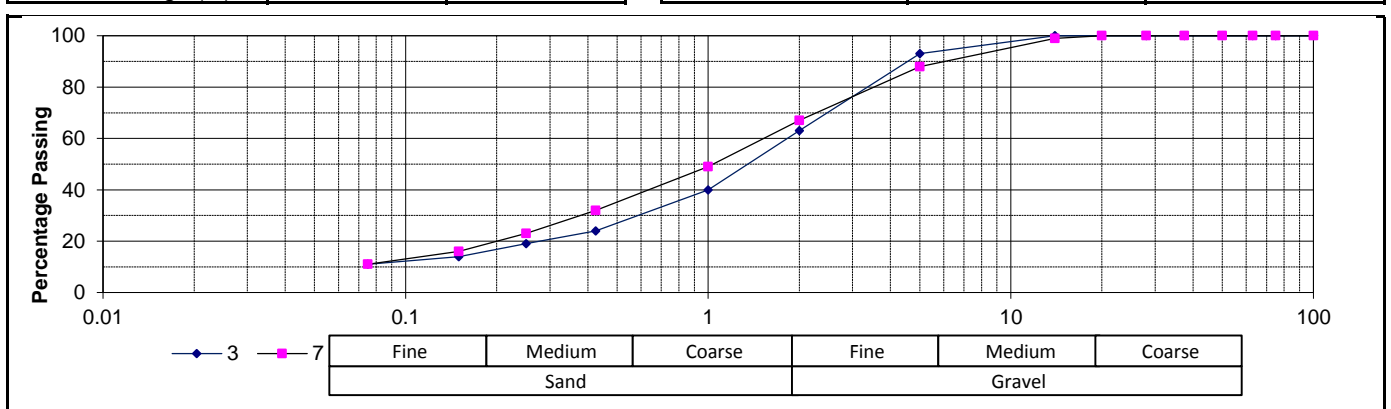


Soil Mortar Analysis			
Coarse Sand	62	52	
Coarse Fine Sand	8	13	
Medium Fine Sand	7	10	
Fine Fine Sand	6	8	
Silt and Clay	17	16	

Interpolated CBR Data			
CBR	@ 100%	68	122
	@ 98%	54	99
	@ 97%	48	89
	@ 95%	38	72
	@ 93%	31	59
	@ 90%	22	43
	@ SANS3001 Midpoint	53	91

Atterberg Limits		SANS 3001 GR10	
Liquid Limit (%)	23		
Plasticity Index (%)	7	NP	
Linear Shrinkage (%)	3.0		

Classifications			
HRB (AASHTO)	A-2-4(0)	A-1-b(0)	
COLTO	G6	G5	
TRH14	G6	G5	



Client : NKANIVO DEVELOPMENT CONSULTANTS (COO)
 Project : Dumphiries (Newington 255KU)
 Project No. : 2020-B-1505

Date Received : 17/11/2020
 Date Reported : 04/12/2020
 Page No. : 14 of 14

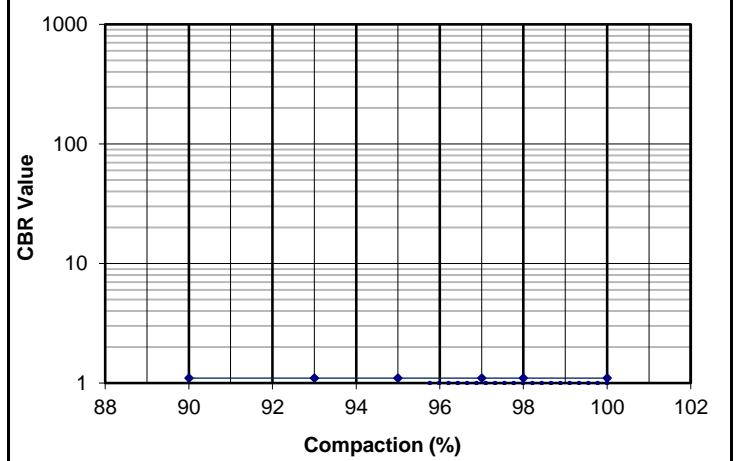
CALIFORNIA BEARING RATIO (CBR) & ROAD INDICATOR REPORT

Laboratory No.	11	◆			■
Field Number	TP17				
Client Reference					
Depth (m)	035-1.50				
Position					
Coordinates	X				
	Y				
Description					
Additional information					
Calcrete/Crushed					
Stabilizing Agent					

Laboratory No.	11	◆			■
Maximum Dry Density & Optimum Moisture Content					SANS 3001 GR30
MDD	kg/m ³	2040			
OMC	%	6.2			

California Bearing Ratio					SANS 3001 GR40
Compaction Data					
Moisture	%	6.3			
Dry Density	kg/m ³	2058	1970	1864	
Compaction	%	100.0	95.7	90.6	
Penetration Data					
CBR at	2.50 mm	1	1	1	
	5.00 mm	1	1	1	
	7.50 mm	3	2	1	
Swell	%	0	0.1	0.1	
Final Moisture (%)		10.2	12.7	16.5	

Sieve Analysis (Wet preparation)		SANS 3001 GR1
Percentage Passing	100 mm	100
	75 mm	100
	63 mm	100
	50 mm	100
	37.5 mm	100
	28 mm	100
	20 mm	100
	14 mm	100
	5 mm	99
	2 mm	88
	1 mm	61
	0.425 mm	36
	0.250 mm	26
	0.150 mm	18
0.075 mm	12	
Grading Modulus	1.6	

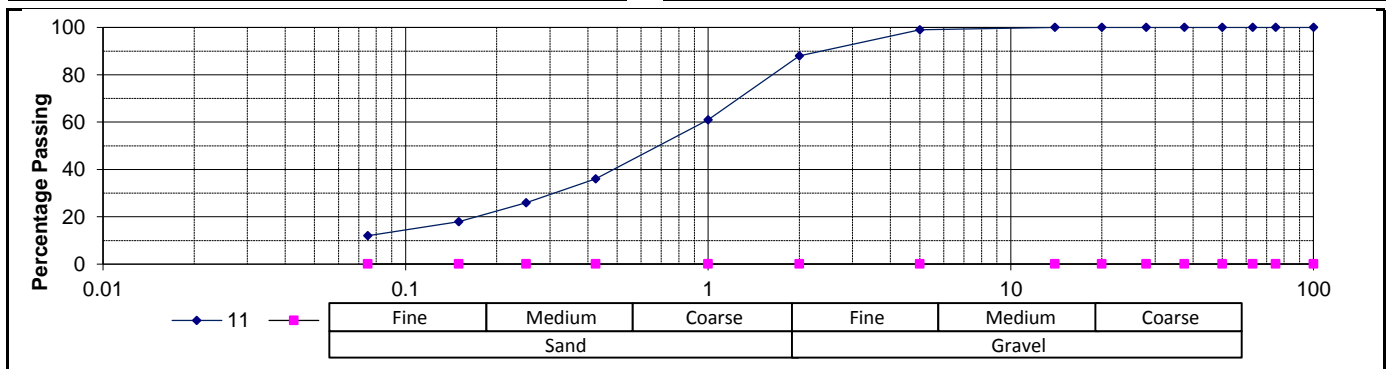


Soil Mortar Analysis	
Coarse Sand	59
Coarse Fine Sand	11
Medium Fine Sand	9
Fine Fine Sand	7
Silt and Clay	14

Interpolated CBR Data			
CBR	Mod. AASHTO	@ 100%	1
		@ 98%	1
		@ 97%	1
		@ 95%	1
		@ 93%	1
		@ 90%	1
		@ SANS3001 Midpoint	1

Atterberg Limits		SANS 3001 GR10
Liquid Limit (%)		
Plasticity Index (%)	NP	
Linear Shrinkage (%)		

Classifications	
HRB (AASHTO)	A-1-b(0)
COLTO	
TRH14	





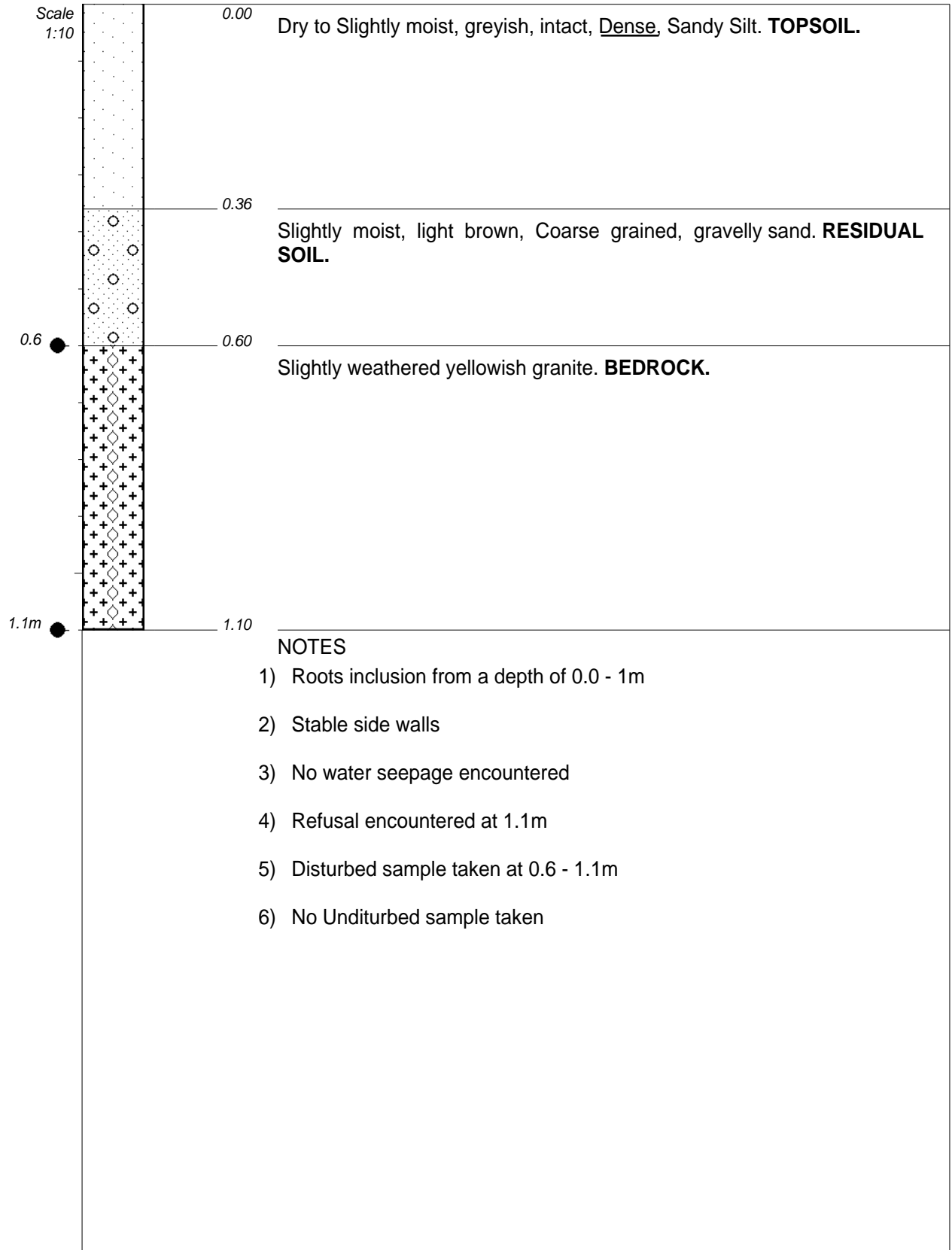
15. APPENDIX C: SOIL PROFILES



Nkanivo Development Consultant
Phase 1 Near surface geotechnical investigation

HOLE No: TP 01A
Sheet 1 of 1

JOB NUMBER: 000



CONTRACTOR :

MACHINE : Tractor Loader Backhoe (TLB).

DRILLED BY :

PROFILED BY : Mavhetha Lavhelesani

TYPE SET BY : Mavhetha Lavhelesani

SETUP FILE : STANDARD.SET

INCLINATION :

DIAM : 0.7 m

DATE :

DATE : 13/11/2020

DATE : 30/05/2021 21:59

TEXT : ..00\Examples\Examples.TXT

ELEVATION : 434m

X-COORD : 31°18'30.00"E

Y-COORD : 24°47'03.30"S

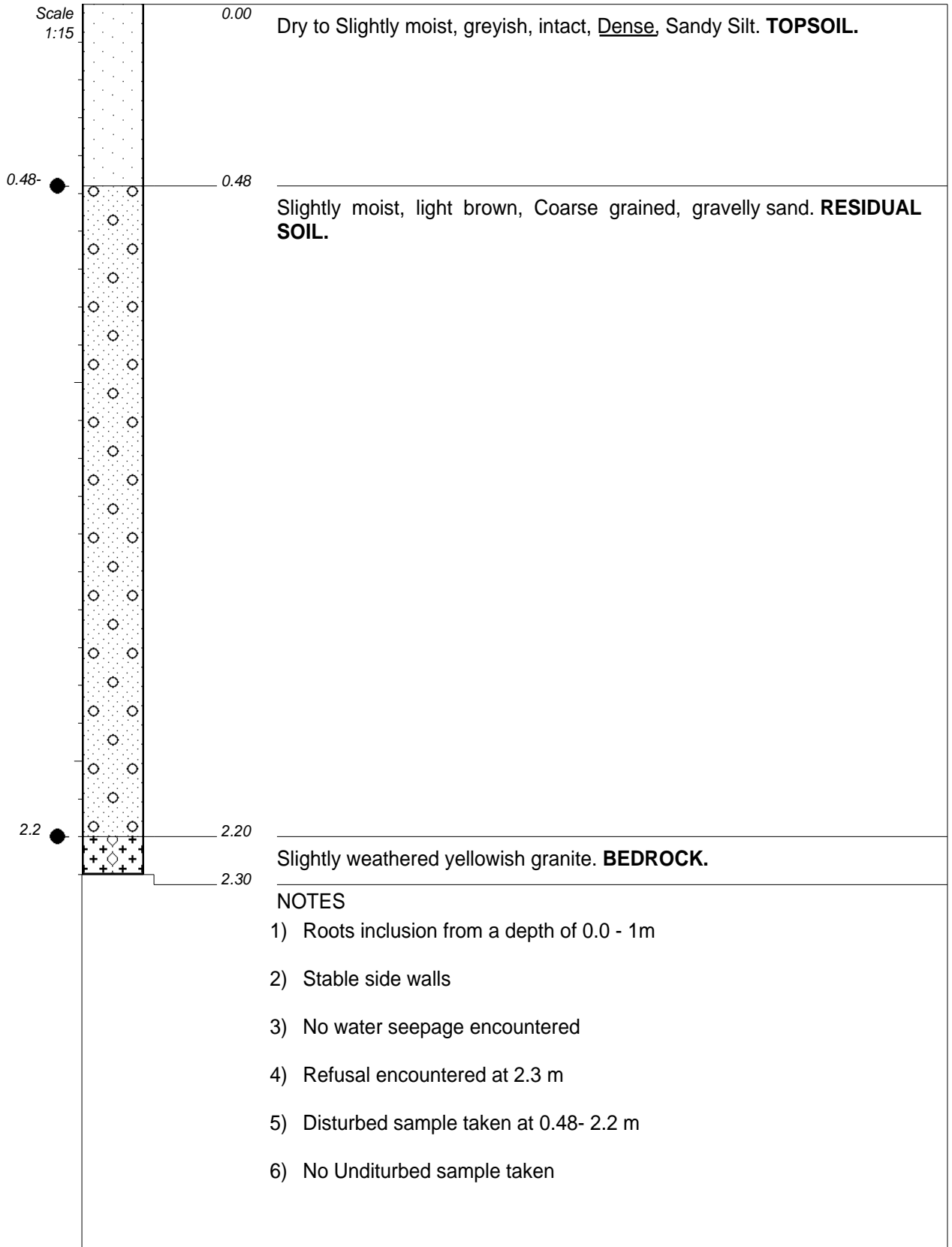
HOLE No: TP 01A



**Nkanivo Development Consultant
Phase 1 Near surface geotechnical investigation**

**HOLE No: TP 02A
Sheet 1 of 1**

JOB NUMBER: 000



CONTRACTOR :
MACHINE : Tractor Loader Backhoe (TLB).
DRILLED BY :
PROFILED BY : Mavhetha Lavhelesani
TYPE SET BY : Mavhetha Lavhelesani
SETUP FILE : STANDARD.SET

INCLINATION :
DIAM : 0.7 m
DATE :
DATE : 13/11/2020
DATE : 30/05/2021 21:59
TEXT : ..00\Examples\Examples.TXT

ELEVATION : 437m
X-COORD : 31°18'26.53"E
Y-COORD : 24°47'00.77"S

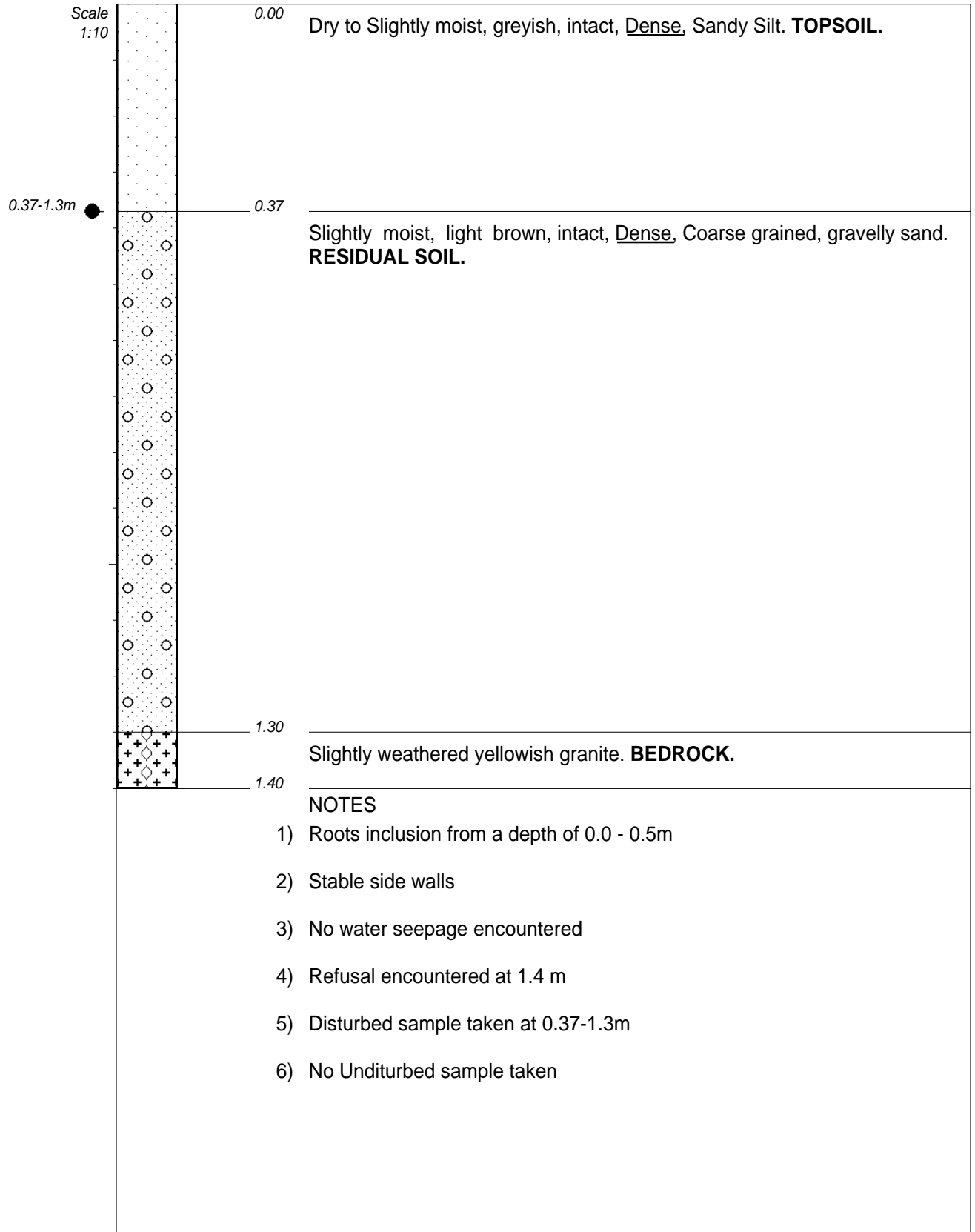
HOLE No: TP 02A



Nkanivo Development Consultant
Phase 1 Near surface geotechnical investigation

HOLE No: TP 03A
Sheet 1 of 1

JOB NUMBER: 000



CONTRACTOR :
MACHINE : Tractor Loader Backhoe (TLB).
DRILLED BY :
PROFILED BY : Mavhetha Lavhelesani
TYPE SET BY : Mavhetha Lavhelesani
SETUP FILE : STANDARD.SET

INCLINATION :
DIAM : 0.7 m
DATE :
DATE : 13/11/2020
DATE : 30/05/2021 21:59
TEXT : ..00\Examples\Examples.TXT

ELEVATION : 430m
X-COORD : 31°18'29.15"E
Y-COORD : 24°46'58.52"S

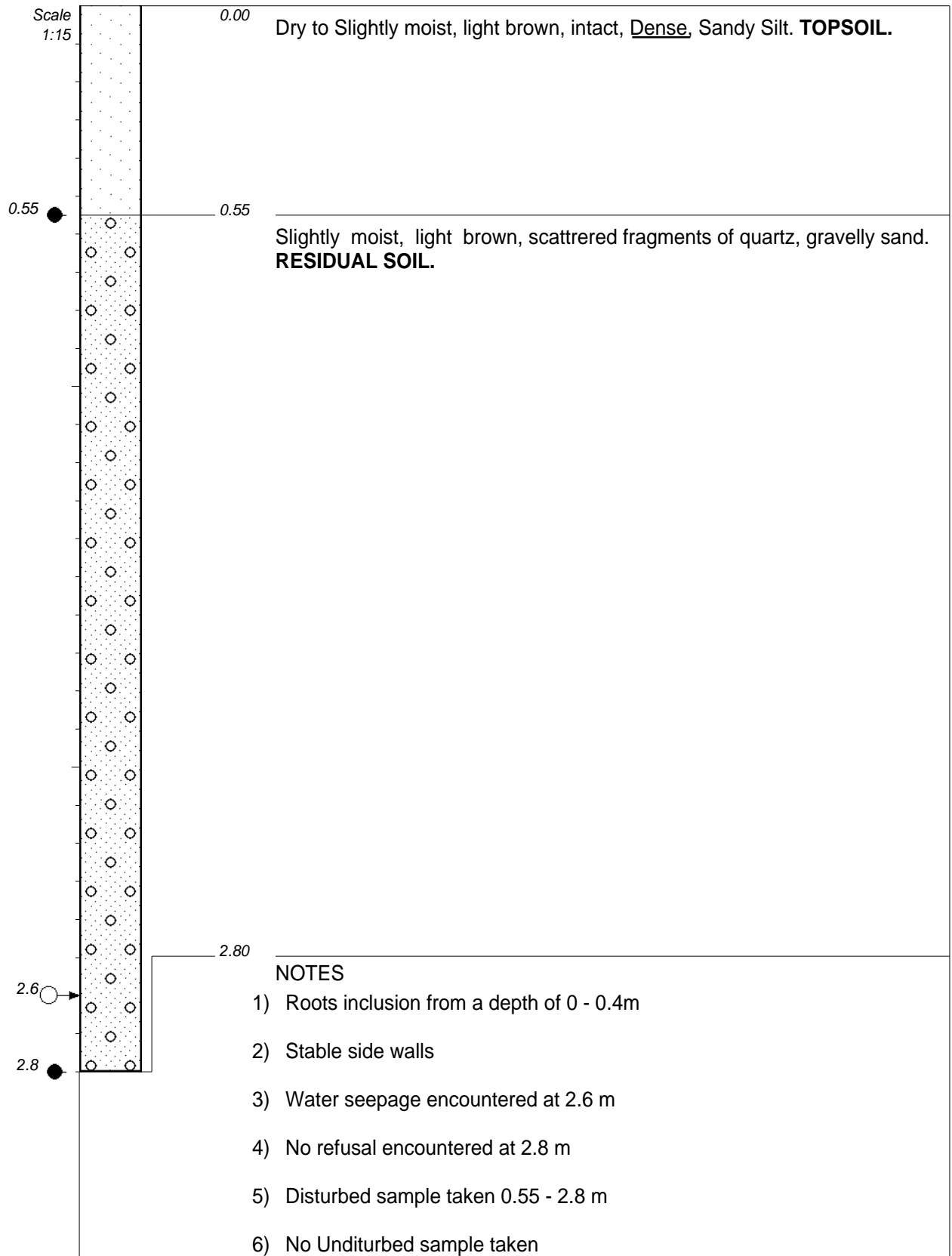
HOLE No: TP 03A



Nkanivo Development Consultant
Phase 1 Near surface geotechnical investigation

HOLE No: TP 04A
Sheet 1 of 1

JOB NUMBER: 000



CONTRACTOR :
MACHINE : Tractor Loader Backhoe (TLB).
DRILLED BY :
PROFILED BY : Mavhetha Lavhelesani
TYPE SET BY : Mavhetha Lavhelesani
SETUP FILE : STANDARD.SET

INCLINATION :
DIAM : 0.7 m
DATE :
DATE : 13/11/2020
DATE : 30/05/2021 21:59
TEXT : ..00\Examples\Examples.TXT

ELEVATION : 431m
X-COORD : 31°18'31.91"E
Y-COORD : 24°47'01.20"S

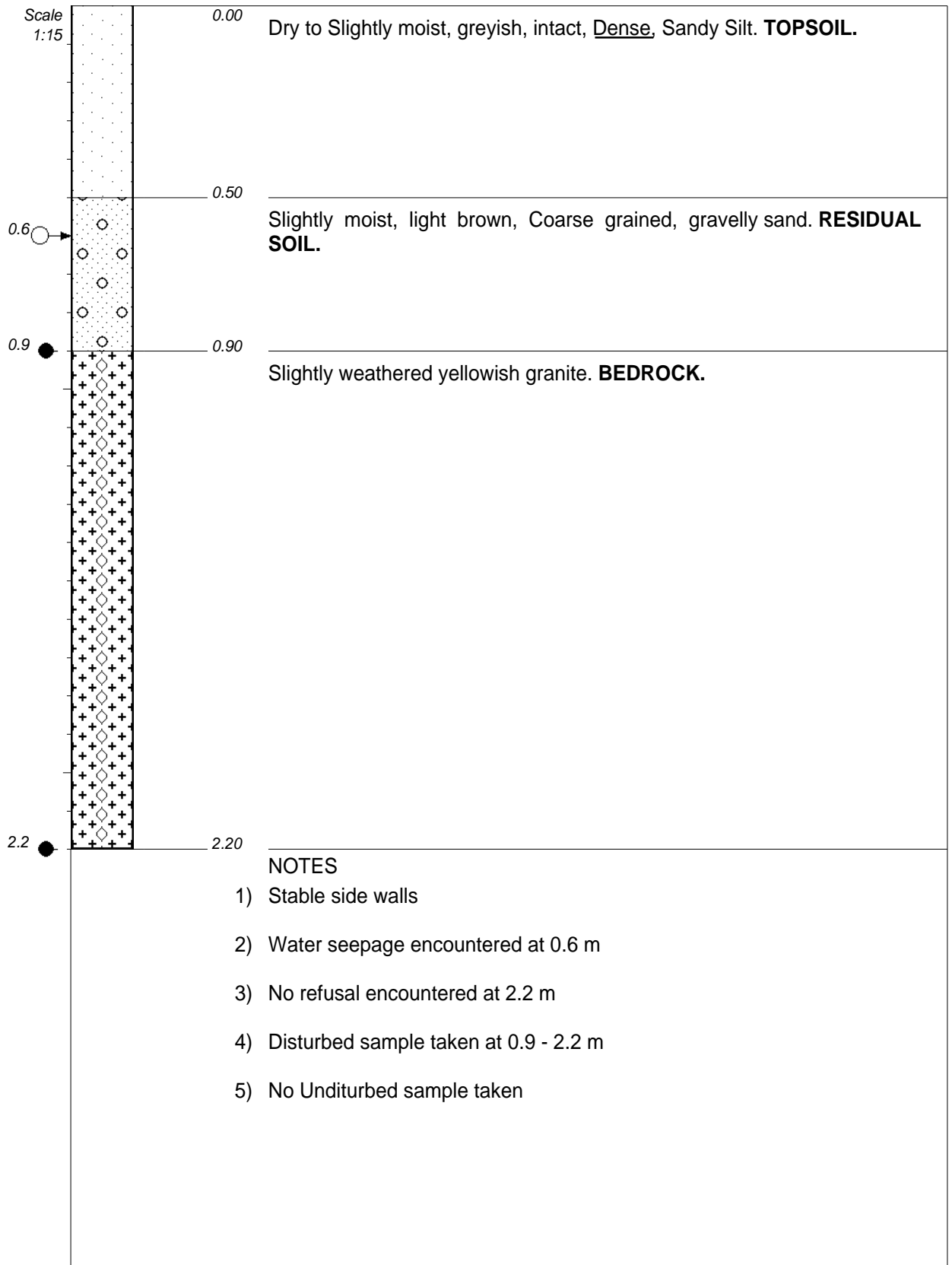
HOLE No: TP 04A



Nkanivo Development Consultant
Phase 1 Near surface geotechnical investigation

HOLE No: TP 05A
Sheet 1 of 1

JOB NUMBER: 000



CONTRACTOR :
MACHINE : Tractor Loader Backhoe (TLB).
DRILLED BY :
PROFILED BY : Mavhetha Lavhelesani
TYPE SET BY : Mavhetha Lavhelesani
SETUP FILE : STANDARD.SET

INCLINATION :
DIAM : 0.7 m
DATE :
DATE : 13/11/2020
DATE : 30/05/2021 21:59
TEXT : ..00\Examples\Examples.TXT

ELEVATION : 436m
X-COORD : 31°18'37.52"E
Y-COORD : 24°46'57.87"S

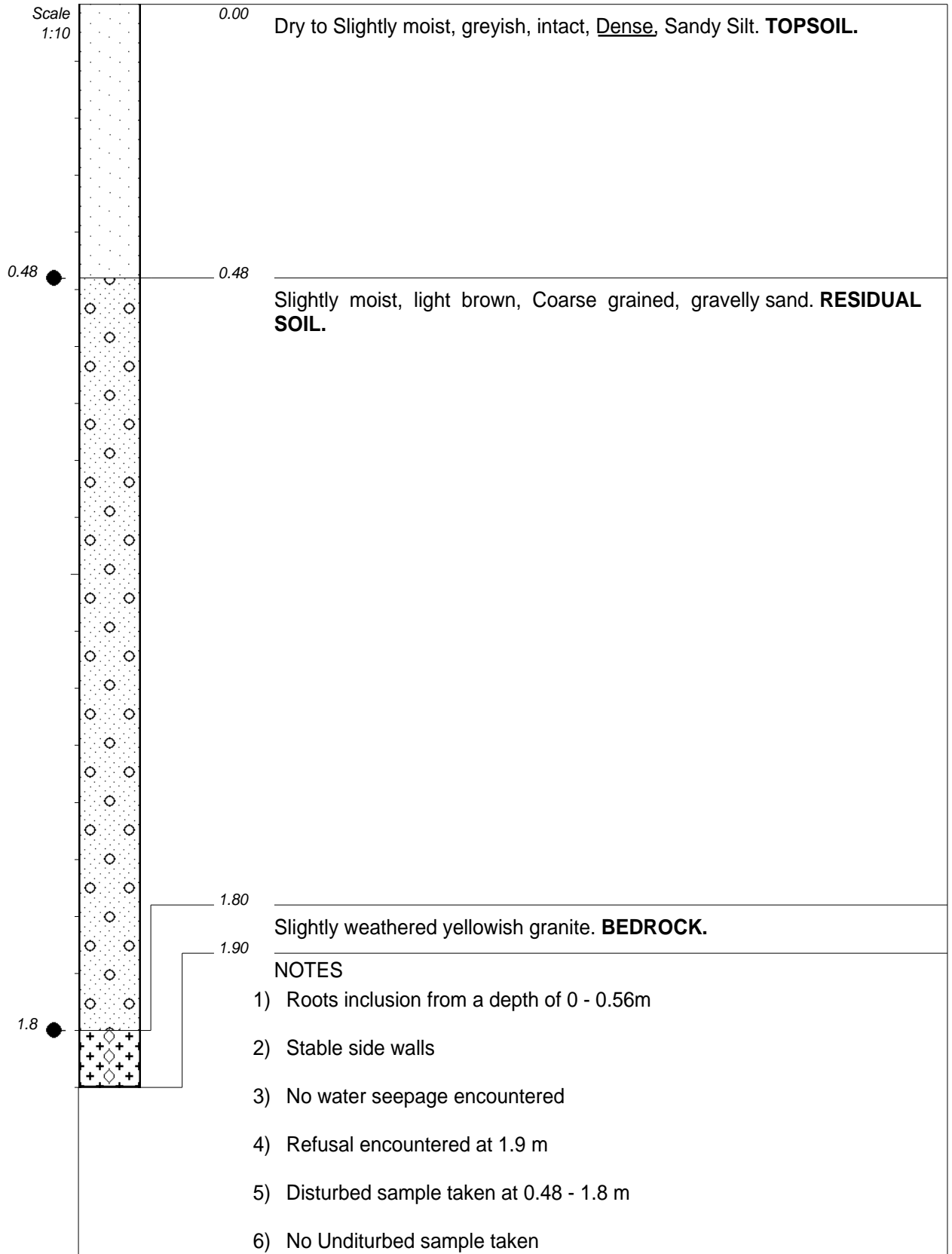
HOLE No: TP 05A



Nkanivo Development Consultant
Phase 1 Near surface geotechnical investigation

HOLE No: TP 06A
Sheet 1 of 1

JOB NUMBER: 000



CONTRACTOR :
MACHINE : Tractor Loader Backhoe (TLB).
DRILLED BY :
PROFILED BY : Mavhetha Lavhelesani
TYPE SET BY : Mavhetha Lavhelesani
SETUP FILE : STANDARD.SET

INCLINATION :
DIAM : 0.7 m
DATE :
DATE : 13/11/2020
DATE : 30/05/2021 21:59
TEXT : ..00\Examples\Examples.TXT

ELEVATION : 440m
X-COORD : 31°18'33.51"E
Y-COORD : 24°46'56.41"S

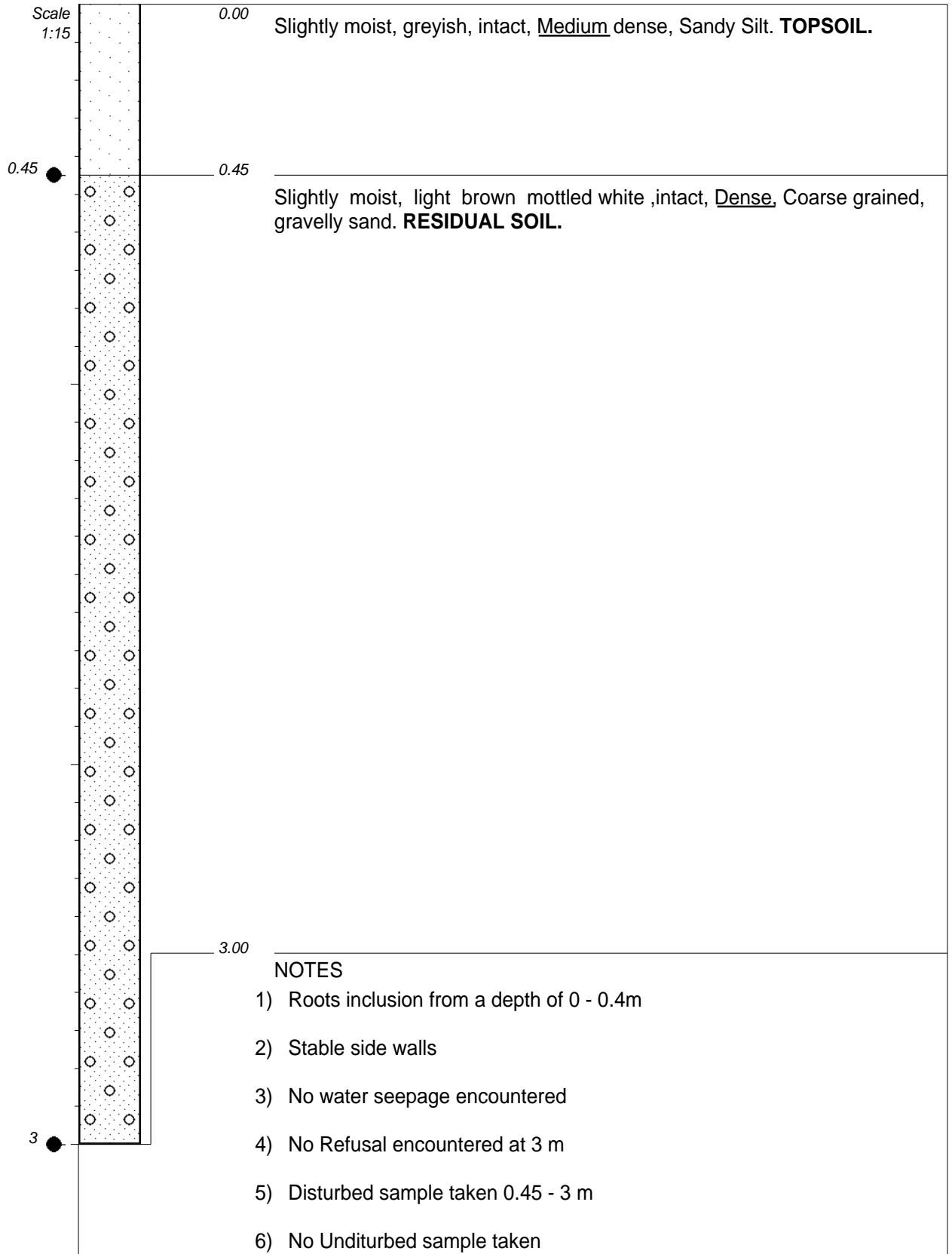
HOLE No: TP 06A



**Nkanivo Development Consultant
Phase 1 Near surface geotechnical investigation**

HOLE No: TP 07A
Sheet 1 of 1

JOB NUMBER: 000



CONTRACTOR :
MACHINE : Tractor Loader Backhoe (TLB).
DRILLED BY :
PROFILED BY : Mavhetha Lavhelesani
TYPE SET BY : Mavhetha Lavhelesani
SETUP FILE : STANDARD.SET

INCLINATION :
DIAM : 0.7 m
DATE :
DATE : 13/11/2020
DATE : 30/05/2021 21:59
TEXT : ..00\Examples\Examples.TXT

ELEVATION : 428m
X-COORD : 31°18'38.35"E
Y-COORD : 24°46'50.71"S

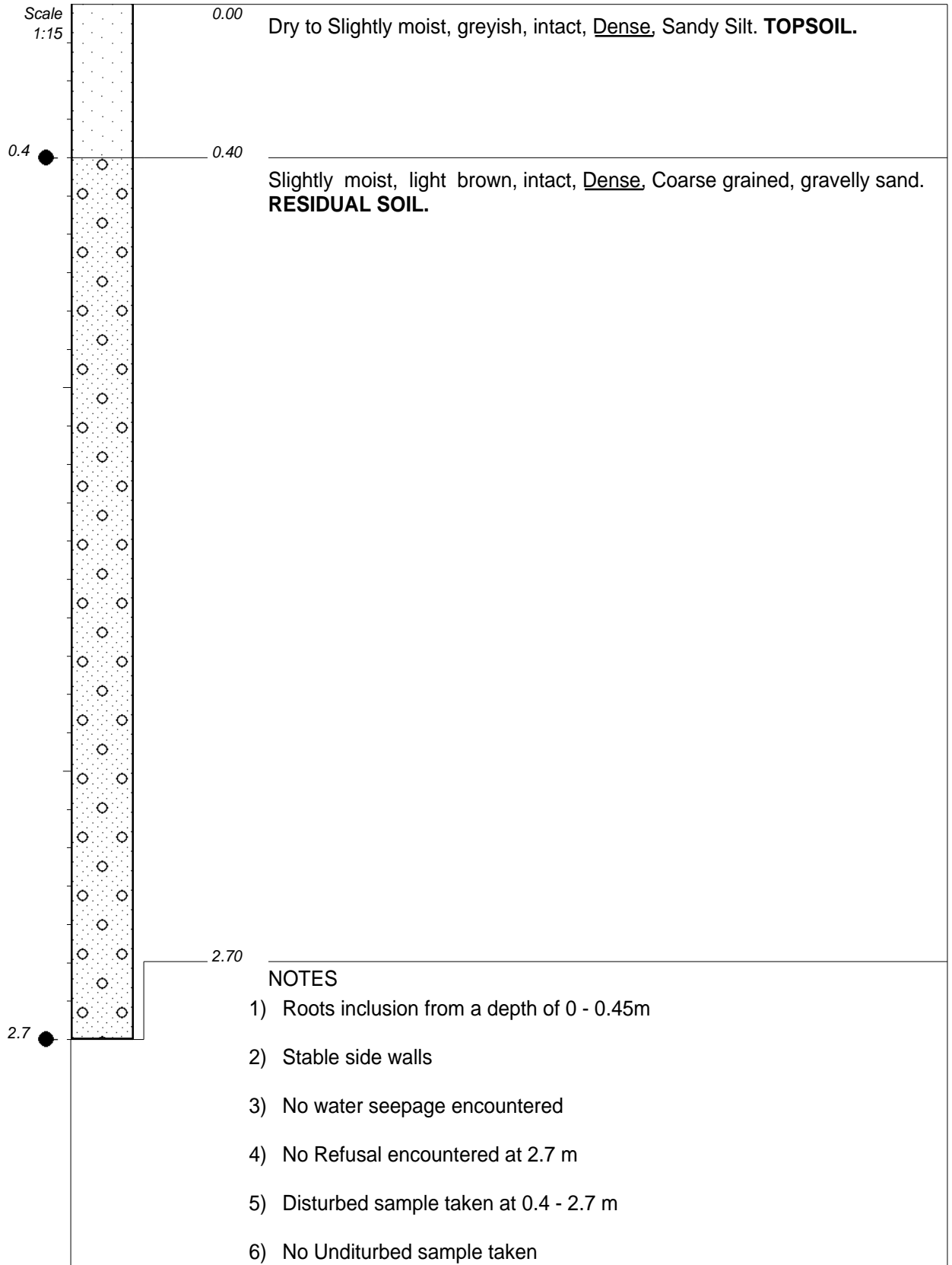
HOLE No: TP 07A



Nkanivo Development Consultant
Phase 1 Near surface geotechnical investigation

HOLE No: TP 08A
Sheet 1 of 1

JOB NUMBER: 000



CONTRACTOR :
MACHINE : Tractor Loader Backhoe (TLB).
DRILLED BY :
PROFILED BY : Mavhetha Lavhelesani
TYPE SET BY : Mavhetha Lavhelesani
SETUP FILE : STANDARD.SET

INCLINATION :
DIAM : 0.7 m
DATE :
DATE : 13/11/2020
DATE : 30/05/2021 21:59
TEXT : ..00\Examples\Examples.TXT

ELEVATION : 440m
X-COORD : 31°18'41.53"E
Y-COORD : 24°46'53.39"S

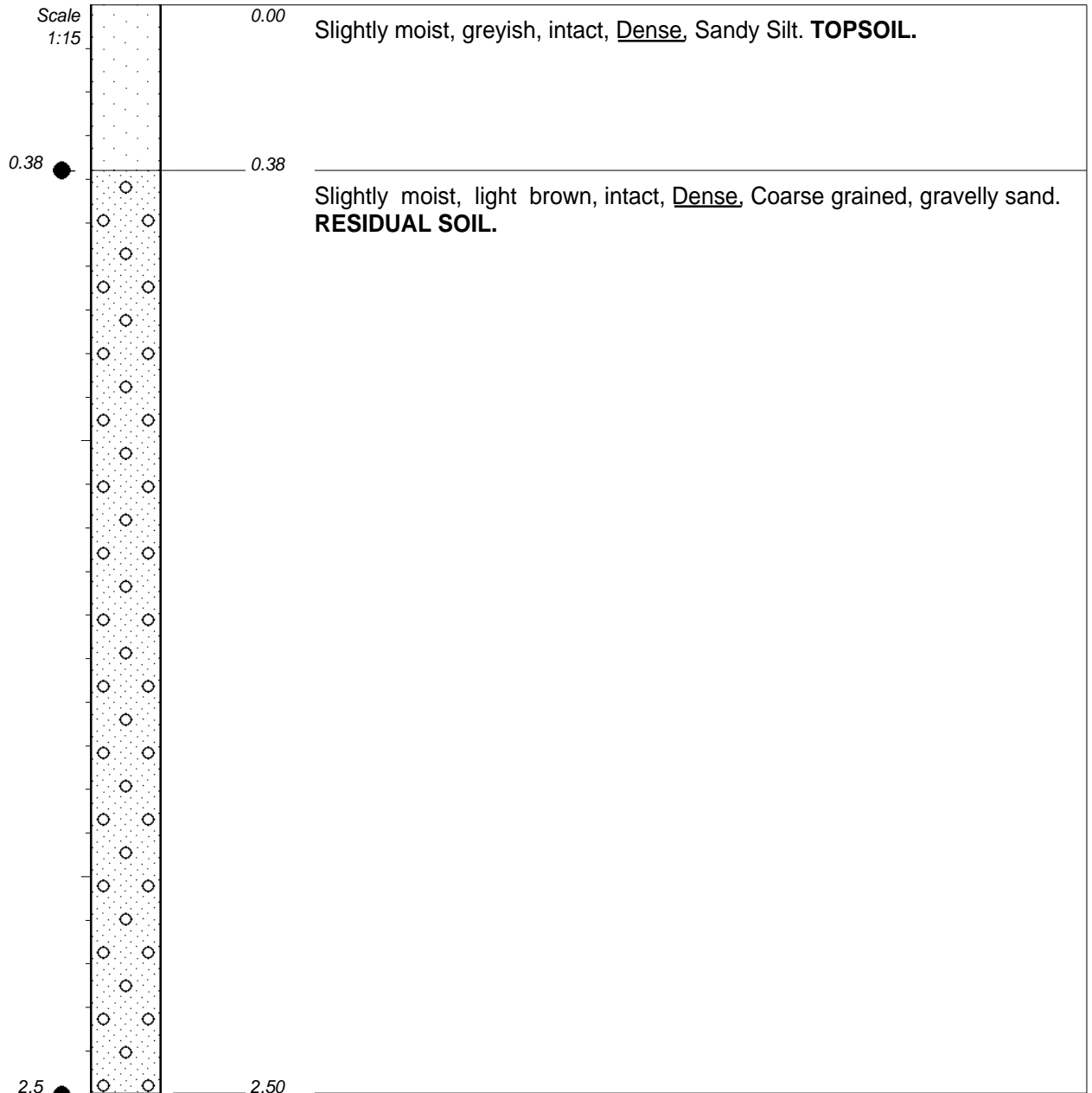
HOLE No: TP 08A



**Nkanivo Development Consultant
Phase 1 Near surface geotechnical investigation**

**HOLE No: TP 09A
Sheet 1 of 1**

JOB NUMBER: 000



NOTES

- 1) Roots inclusion from a depth of 0 - 0.45m
- 2) Stable side walls
- 3) No water seepage encountered
- 4) Refusal encountered at 2.5 m
- 5) Disturbed sample taken at 0.38 - 2.5 m
- 6) No Undisturbed sample taken

CONTRACTOR :

MACHINE : Tractor Loader Backhoe (TLB).

DRILLED BY :

PROFILED BY : Mavhetha Lavhelesani

TYPE SET BY : Mavhetha Lavhelesani

SETUP FILE : STANDARD.SET

INCLINATION :

DIAM : 0.7 m

DATE :

DATE : 13/11/2020

DATE : 30/05/2021 21:59

TEXT : ..00\Examples\Examples.TXT

ELEVATION : 437m

X-COORD : 31°18'46.14"E

Y-COORD : 24°46'49.12"S

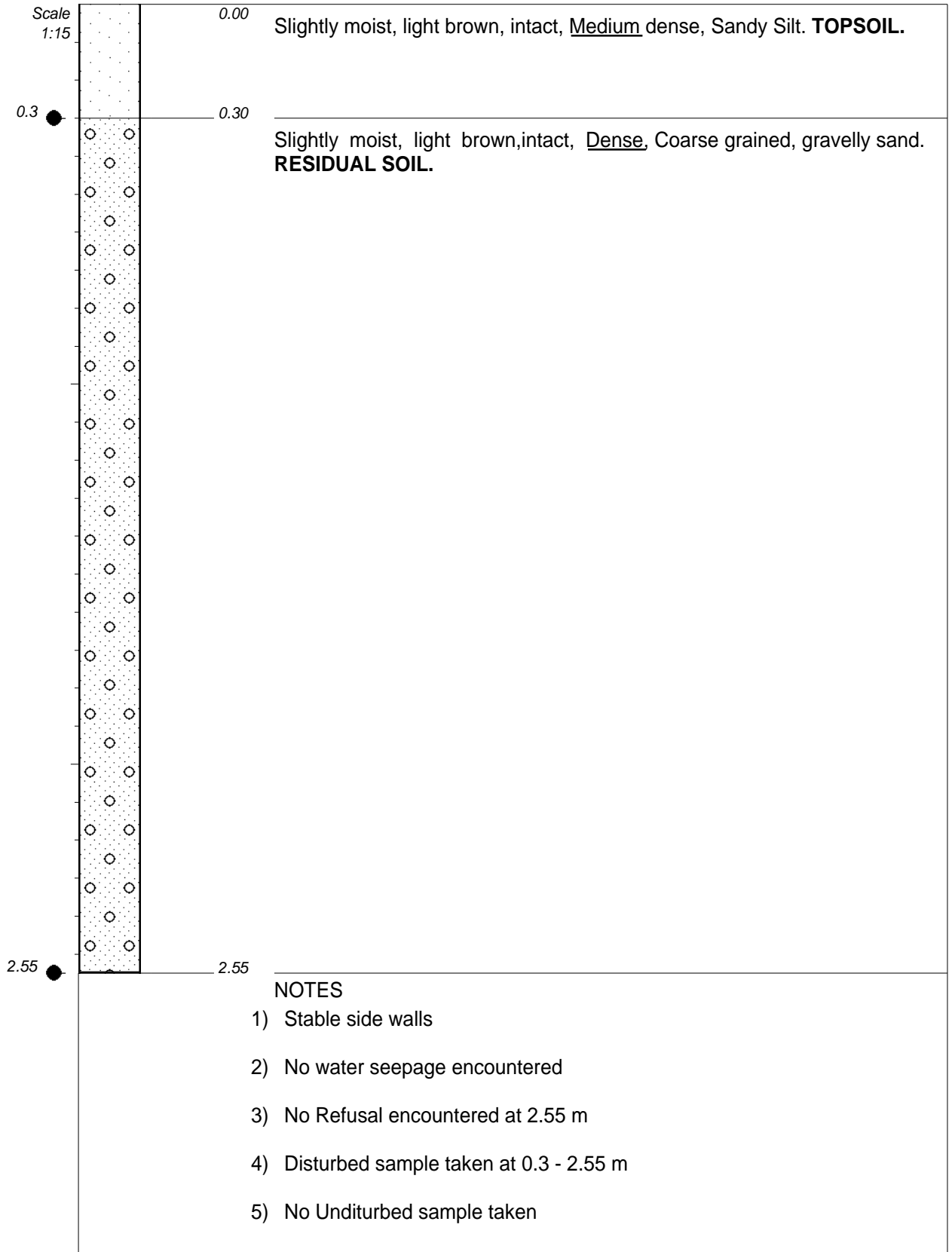
HOLE No: TP 09A



Nkanivo Development Consultant
Phase 1 Near surface geotechnical investigation

HOLE No: TP 10A
Sheet 1 of 1

JOB NUMBER: 000



CONTRACTOR :

MACHINE : Tractor Loader Backhoe (TLB).

DRILLED BY :

PROFILED BY : Mavhetha Lavhelesani

TYPE SET BY : Mavhetha Lavhelesani

SETUP FILE : STANDARD.SET

INCLINATION :

DIAM : 0.7 m

DATE :

DATE : 13/11/2020

DATE : 30/05/2021 21:59

TEXT : ..00\Examples\Examples.TXT

ELEVATION : 435m

X-COORD : 31°18'42.31"E

Y-COORD : 24°46'45.93"S

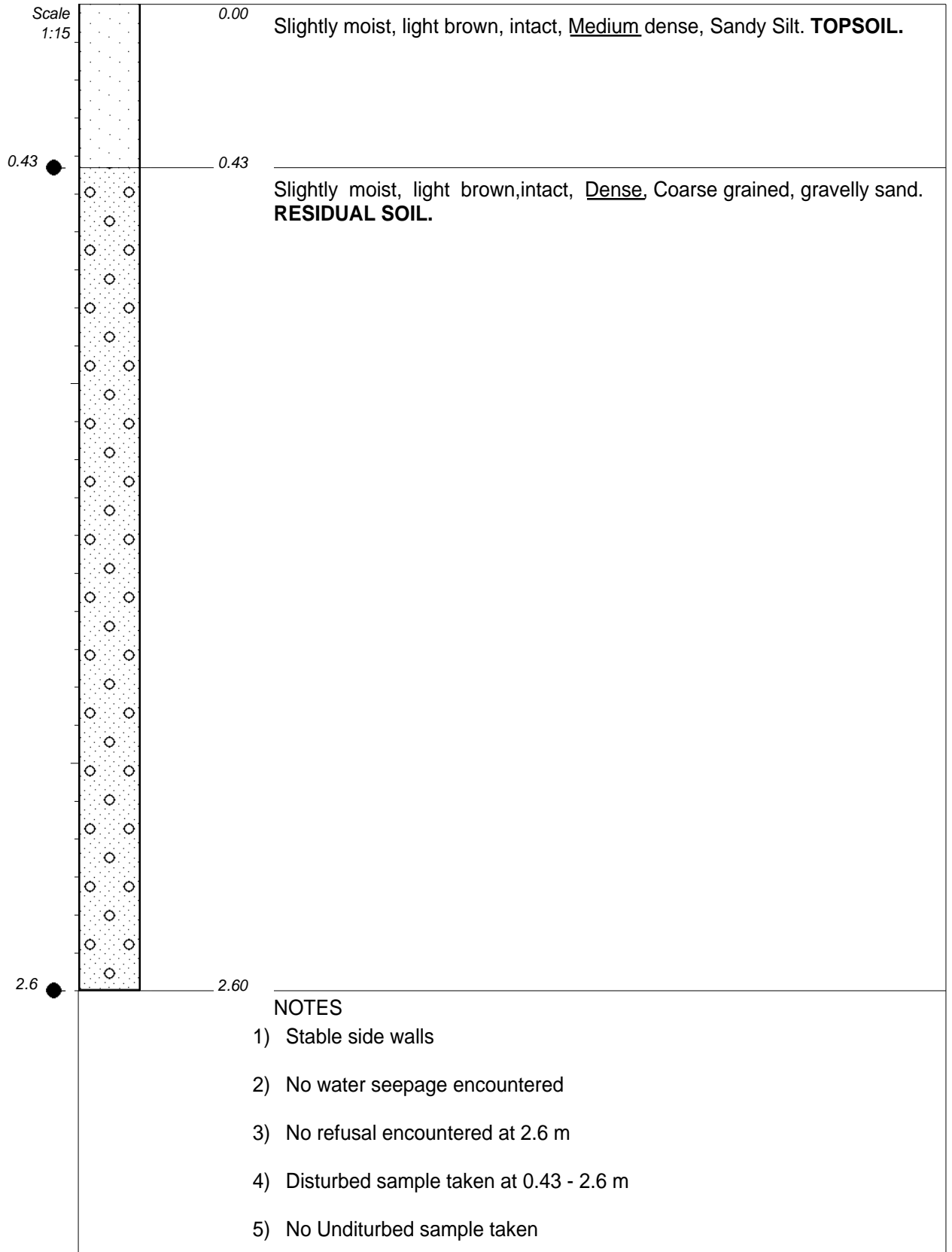
HOLE No: TP 10A



Nkanivo Development Consultant
Phase 1 Near surface geotechnical investigation

HOLE No: TP 11A
Sheet 1 of 1

JOB NUMBER: 000



CONTRACTOR :
MACHINE : Tractor Loader Backhoe (TLB).
DRILLED BY :
PROFILED BY : Mavhetha Lavhelesani
TYPE SET BY : Mavhetha Lavhelesani
SETUP FILE : STANDARD.SET

INCLINATION :
DIAM : 0.7 m
DATE :
DATE : 13/11/2020
DATE : 30/05/2021 21:59
TEXT : ..00\Examples\Examples.TXT

ELEVATION : 442m
X-COORD : 31°18'37.24"E
Y-COORD : 24°46'42.92"S

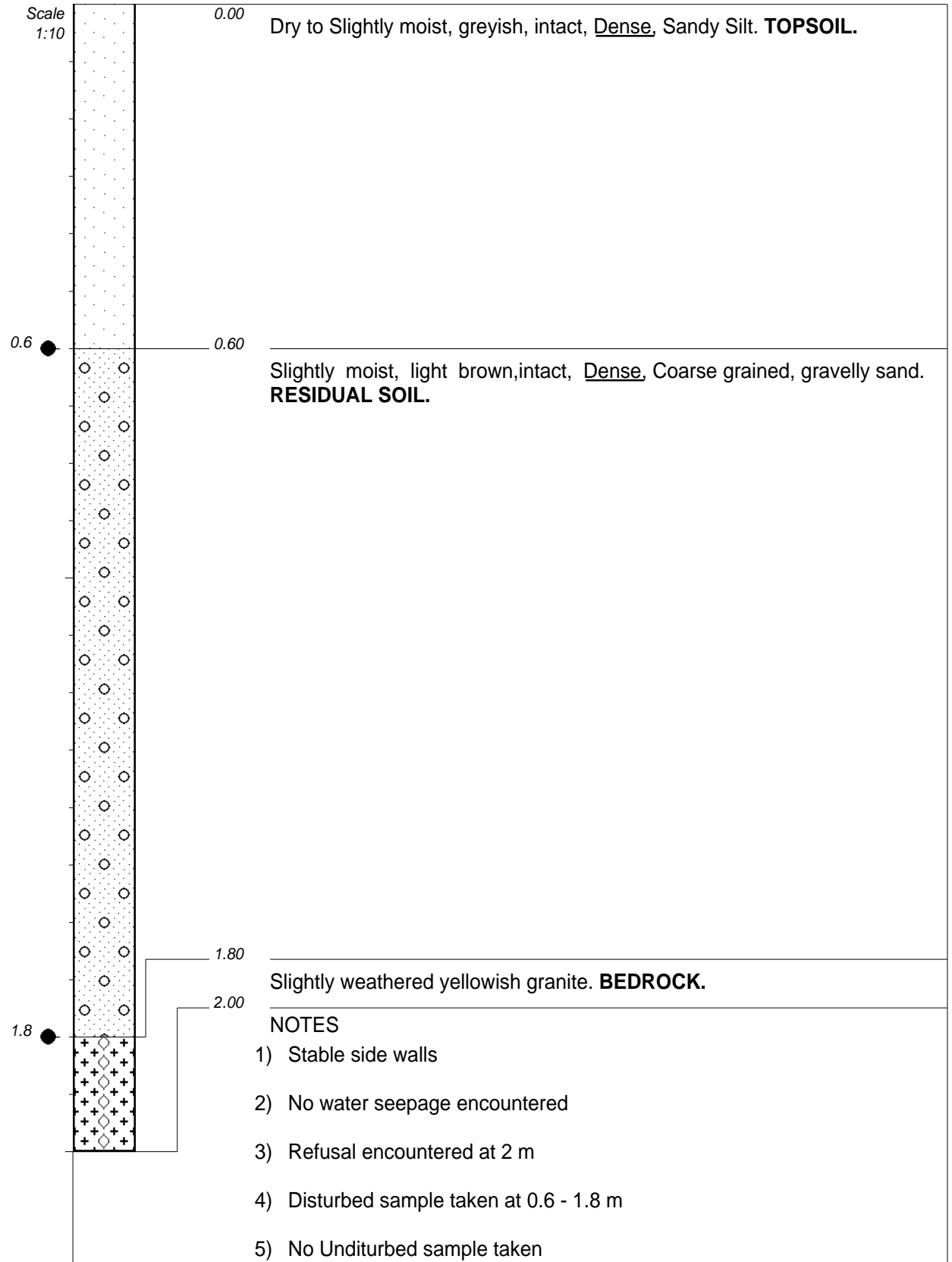
HOLE No: TP 11A



Nkanivo Development Consultant
Phase 1 Near surface geotechnical investigation

HOLE No: TP 12A
Sheet 1 of 1

JOB NUMBER: 000



CONTRACTOR :
MACHINE : Tractor Loader Backhoe (TLB).
DRILLED BY :
PROFILED BY : Mavhetha Lavhelesani
TYPE SET BY : Mavhetha Lavhelesani
SETUP FILE : STANDARD.SET

INCLINATION :
DIAM : 0.7 m
DATE :
DATE : 13/11/2020

ELEVATION : 436m
X-COORD : 31°18'31.21"E
Y-COORD : 24°46'53.88"S

HOLE No: TP 12A

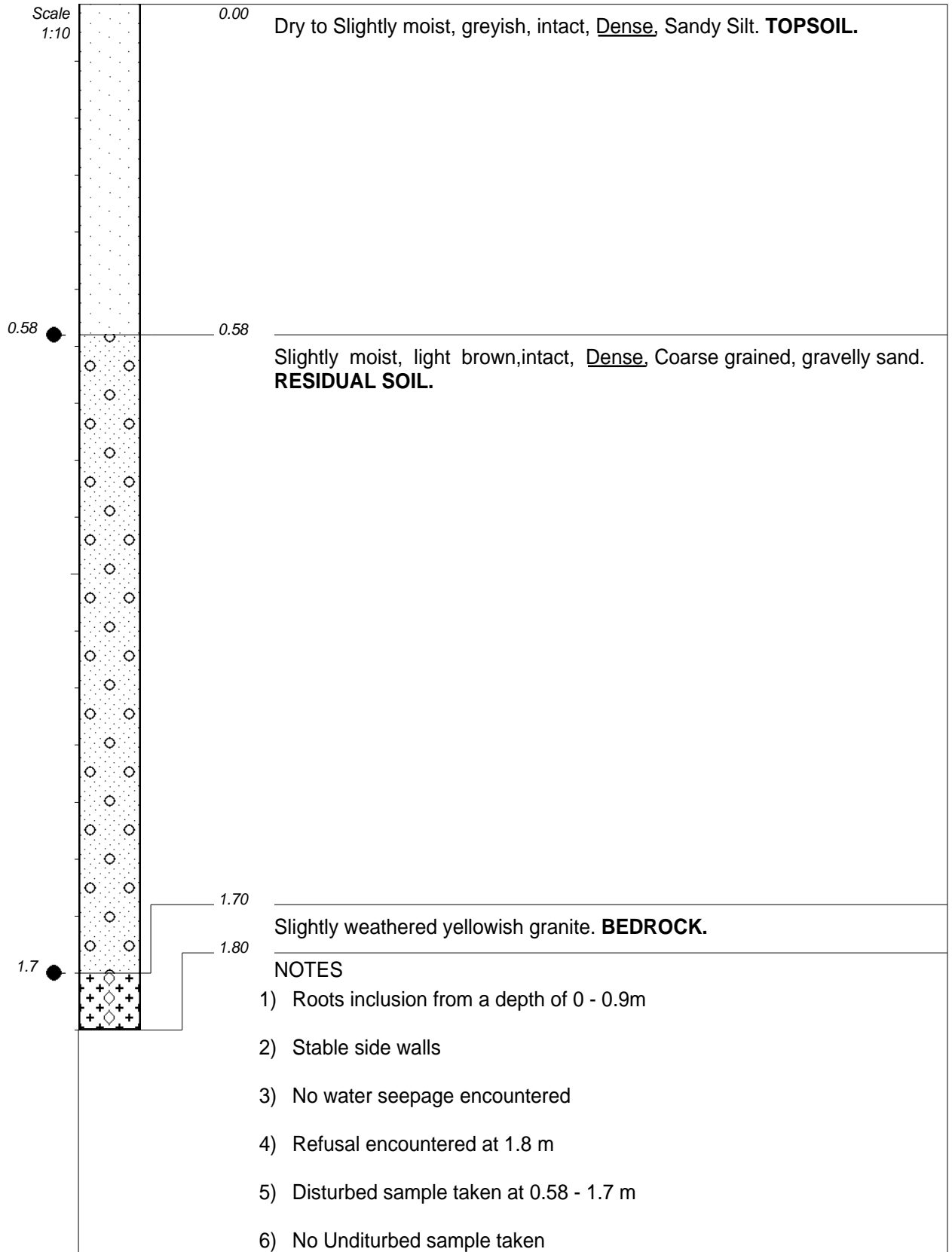
DATE : 30/05/2021 21:59
TEXT : ..00\Examples\Examples.TXT



Nkanivo Development Consultant
Phase 1 Near surface geotechnical investigation

HOLE No: TP 13A
Sheet 1 of 1

JOB NUMBER: 000



CONTRACTOR :
MACHINE : Tractor Loader Backhoe (TLB).
DRILLED BY :
PROFILED BY : Mavhetha Lavhelesani
TYPE SET BY : Mavhetha Lavhelesani
SETUP FILE : STANDARD.SET

INCLINATION :
DIAM : 0.7 m
DATE :
DATE : 13/11/2020
DATE : 30/05/2021 21:59
TEXT : ..00\Examples\Examples.TXT

ELEVATION : 438m
X-COORD : 31°18'38.59"E
Y-COORD : 24°46'47.68"S

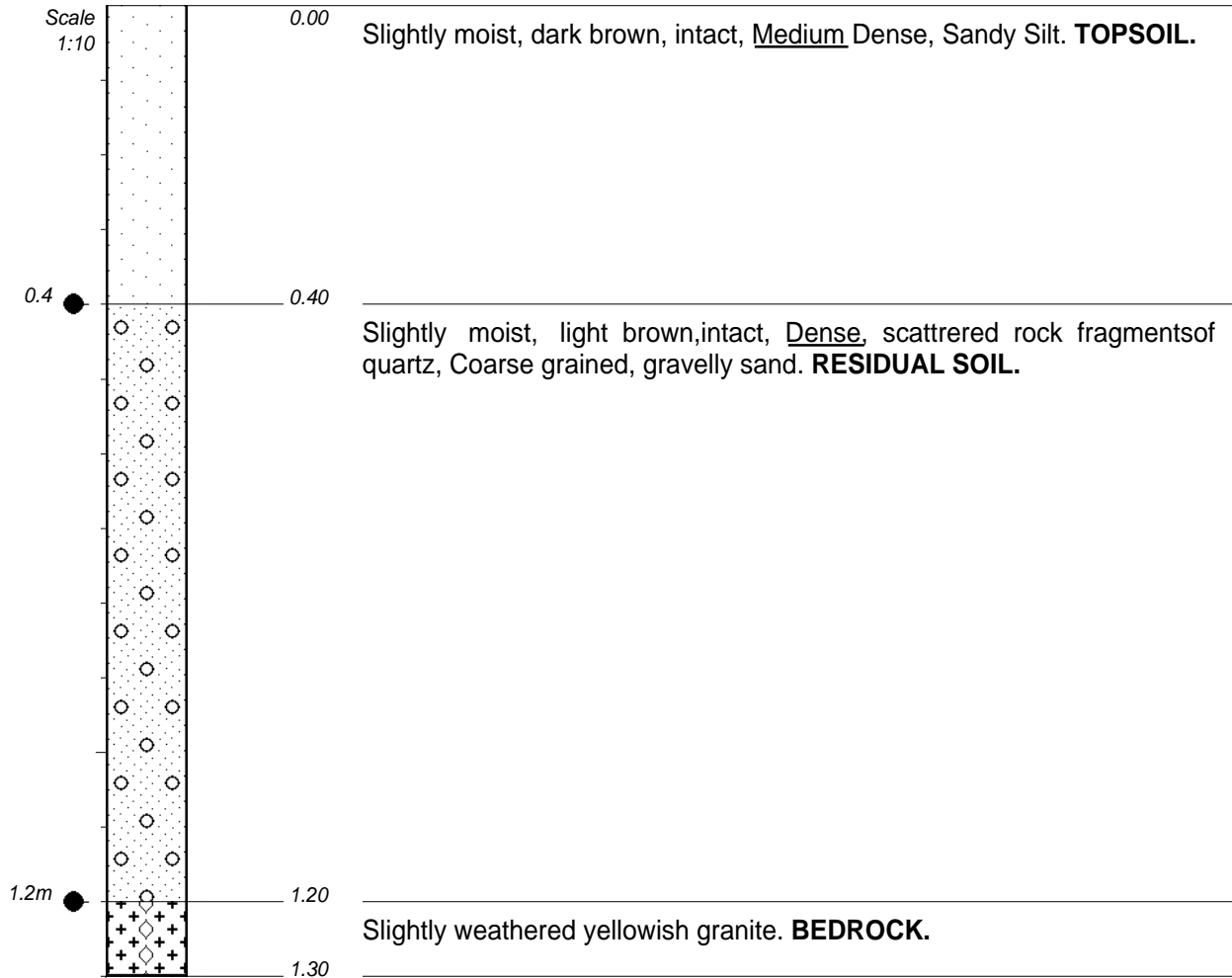
HOLE No: TP 13A



**Nkanivo Development Consultant
Phase 1 Near surface geotechnical investigation**

HOLE No: TP 14A
Sheet 1 of 1

JOB NUMBER: 000



NOTES

- 1) Stable side walls
- 2) No water seepage encountered
- 3) Refusal encountered at 1.3 m
- 4) Disturbed sample taken at 0.4 - 1.2m
- 5) No Undisturbed sample taken

CONTRACTOR :
MACHINE : Tractor Loader Backhoe (TLB).
DRILLED BY :
PROFILED BY : Mavhetha Lavhelesani
TYPE SET BY : Mavhetha Lavhelesani
SETUP FILE : STANDARD.SET

INCLINATION :
DIAM : 0.7 m
DATE :
DATE : 13/11/2020
DATE : 30/05/2021 21:59
TEXT : ..00\Examples\Examples.TXT

ELEVATION : 439m
X-COORD : 31°18'33.59"E
Y-COORD : 24°46'45.89"S

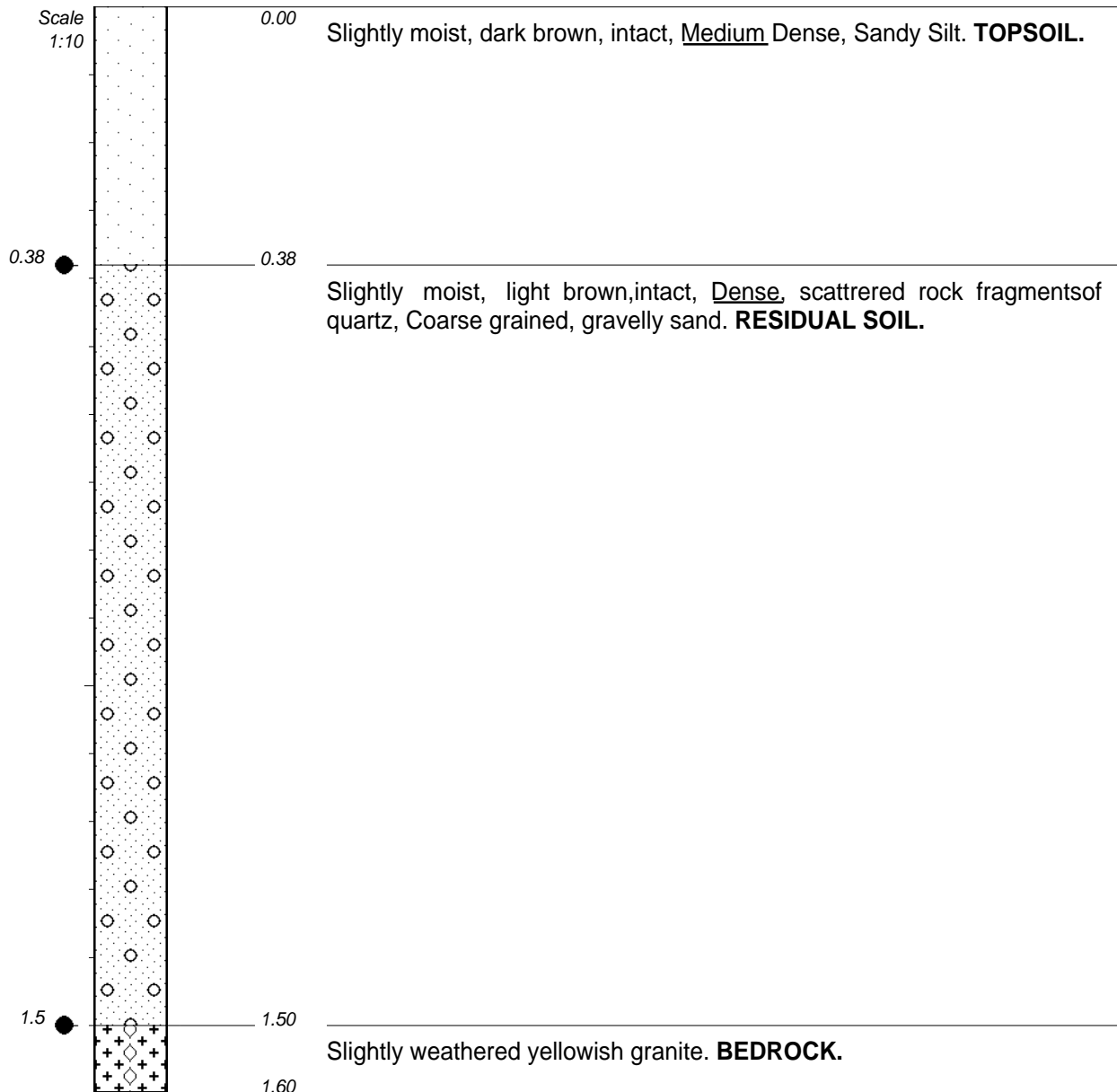
HOLE No: TP 14A



Nkanivo Development Consultant
Phase 1 Near surface geotechnical investigation

HOLE No: TP 15A
Sheet 1 of 1

JOB NUMBER: 000



NOTES

- 1) Stable side walls
- 2) No water seepage encountered
- 3) Refusal encountered at 1.6 m
- 4) Disturbed sample taken at 0.38 - 1.5 m
- 5) No Undisturbed sample taken

CONTRACTOR :

MACHINE : Tractor Loader Backhoe (TLB).

DRILLED BY :

PROFILED BY : Mavhetha Lavhelesani

TYPE SET BY : Mavhetha Lavhelesani

SETUP FILE : STANDARD.SET

INCLINATION :

DIAM : 0.7 m

DATE :

DATE : 13/11/2020

DATE : 30/05/2021 21:59

TEXT : ..00\Examples\Examples.TXT

ELEVATION : 444m

X-COORD : 31°18'34.29"E

Y-COORD : 24°46'50.50"S

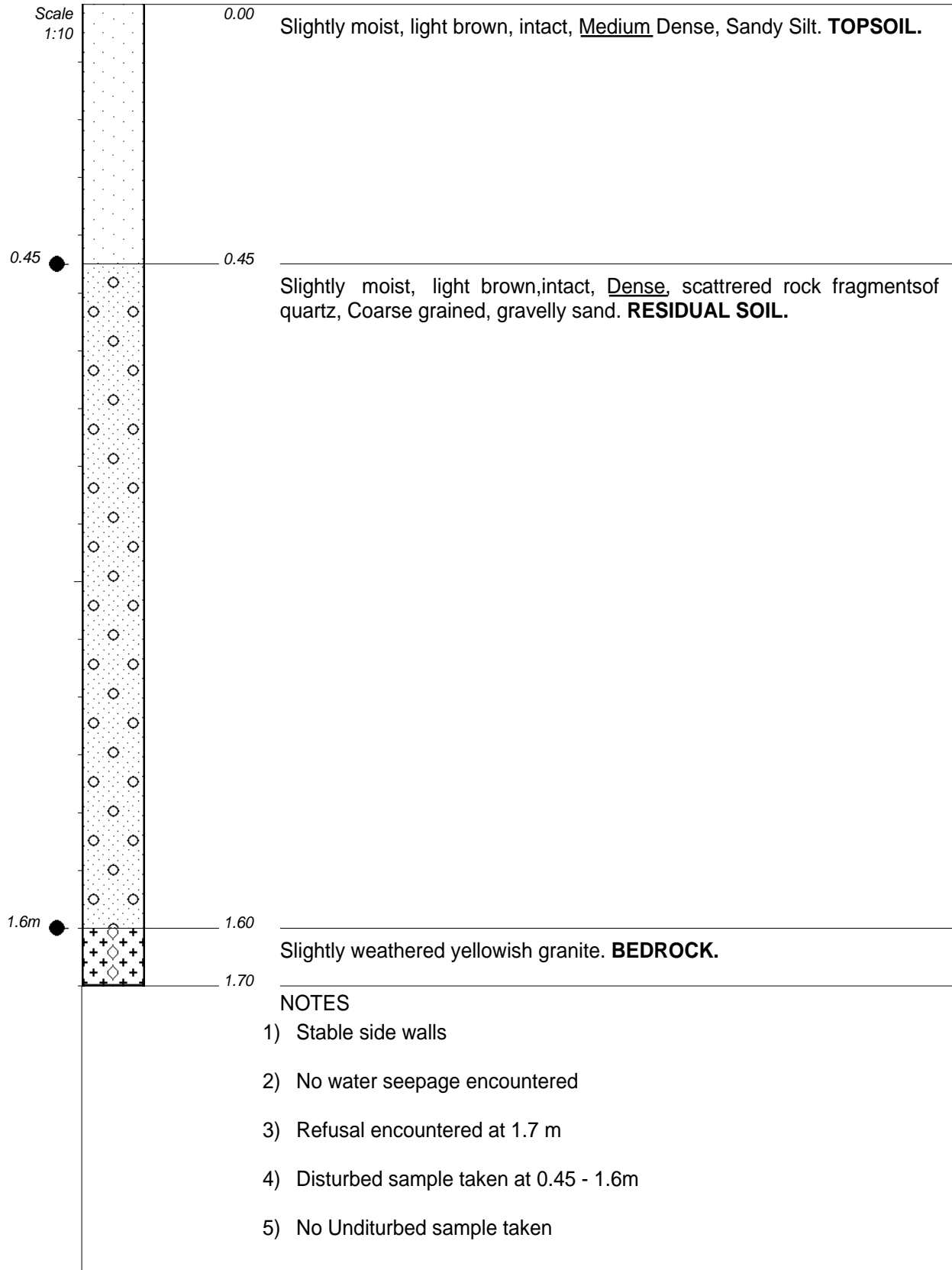
HOLE No: TP 15A



**Nkanivo Development Consultant
Phase 1 Near surface geotechnical investigation**

HOLE No: TP 16A
Sheet 1 of 1

JOB NUMBER: 000



CONTRACTOR :
MACHINE : Tractor Loader Backhoe (TLB).
DRILLED BY :
PROFILED BY : Mavhetha Lavhelesani
TYPE SET BY : Mavhetha Lavhelesani
SETUP FILE : STANDARD.SET

INCLINATION :
DIAM : 0.7 m
DATE :
DATE : 13/11/2020
DATE : 30/05/2021 21:59
TEXT : ..00\Examples\Examples.TXT

ELEVATION : 448m
X-COORD : 31°18'29.71"E
Y-COORD : 24°46'48.99"S

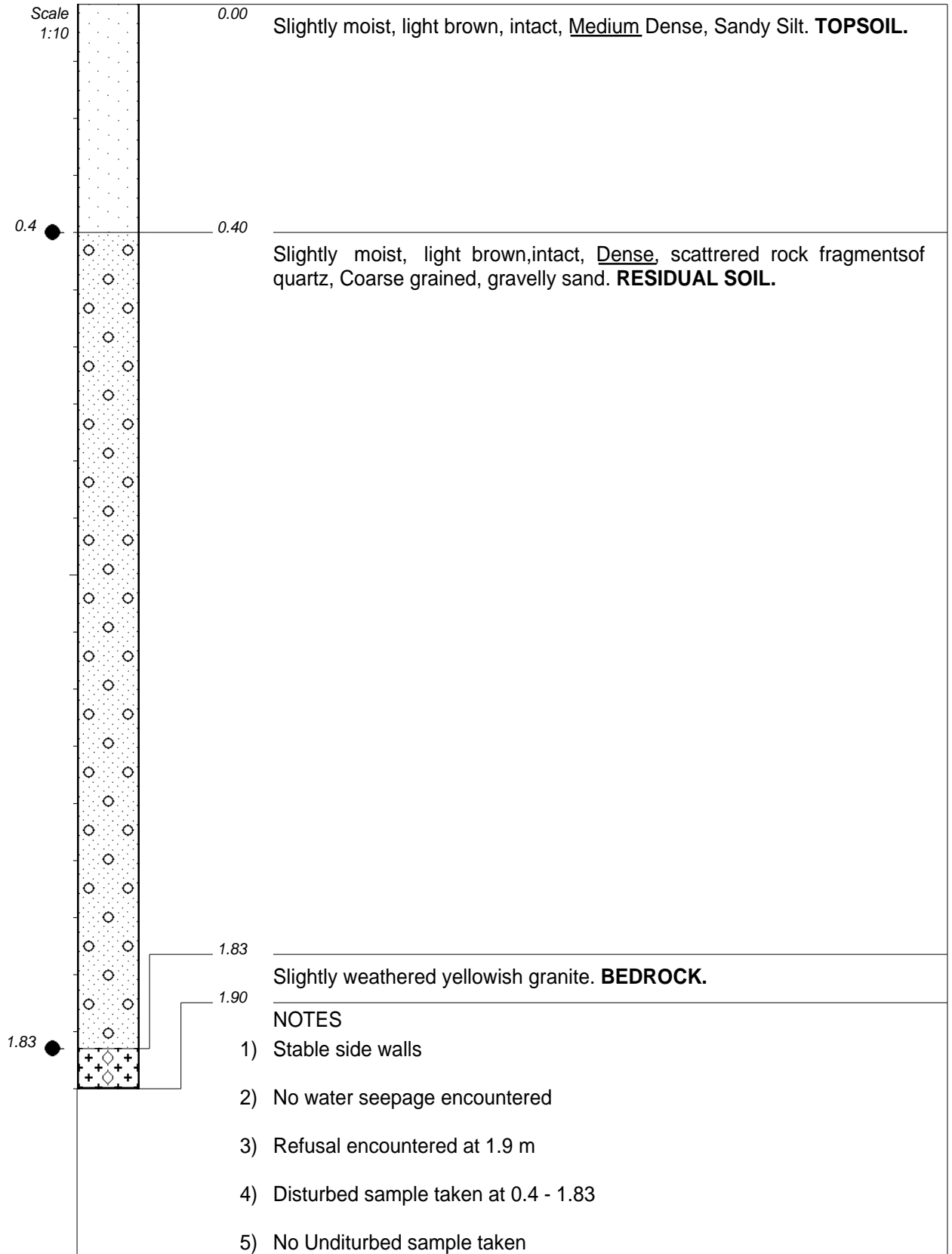
HOLE No: TP 16A



Nkanivo Development Consultant
Phase 1 Near surface geotechnical investigation

HOLE No: TP 17A
Sheet 1 of 1

JOB NUMBER: 000

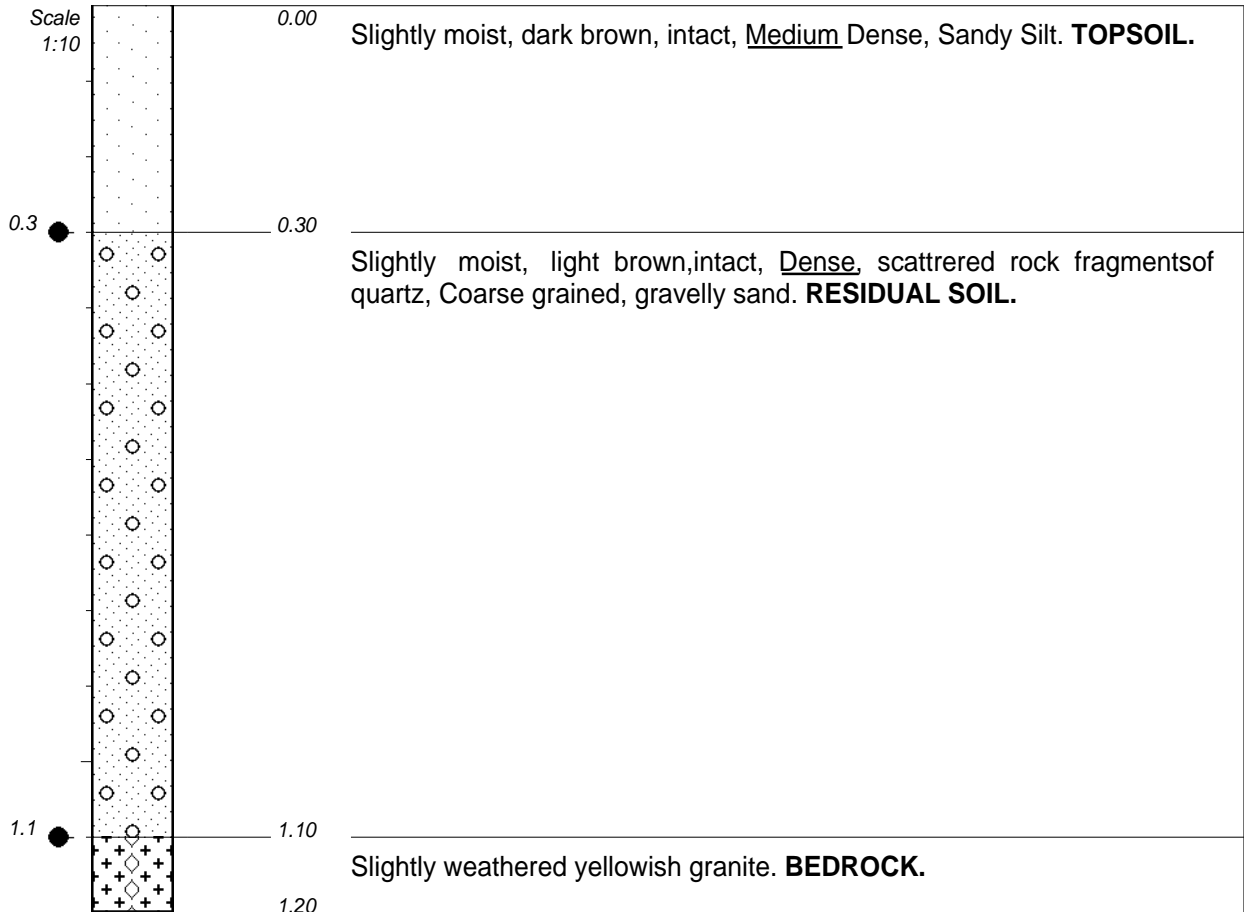


CONTRACTOR :
MACHINE : Tractor Loader Backhoe (TLB).
DRILLED BY :
PROFILED BY : Mavhetha Lavhelesani
TYPE SET BY : Mavhetha Lavhelesani
SETUP FILE : STANDARD.SET

INCLINATION :
DIAM : 0.7 m
DATE :
DATE : 13/11/2020
DATE : 30/05/2021 21:59
TEXT : ..00\Examples\Examples.TXT

ELEVATION : 451m
X-COORD : 31°18'25.56"E
Y-COORD : 24°46'52.24"S

HOLE No: TP 17A



NOTES

- 1) Stable side walls
- 2) No water seepage encountered
- 3) Refusal encountered at 1.2 m
- 4) Disturbed sample taken at 0.3 - 1.1 m
- 5) No Undisturbed sample taken

CONTRACTOR :
 MACHINE : Tractor Loader Backhoe (TLB).
 DRILLED BY :
 PROFILED BY : Mavhetha Lavhelesani
 TYPE SET BY : Mavhetha Lavhelesani
 SETUP FILE : STANDARD.SET

INCLINATION :
 DIAM : 0.7 m
 DATE :
 DATE : 13/11/2020
 DATE : 30/05/2021 21:59
 TEXT : ..00\Examples\Examples.TXT

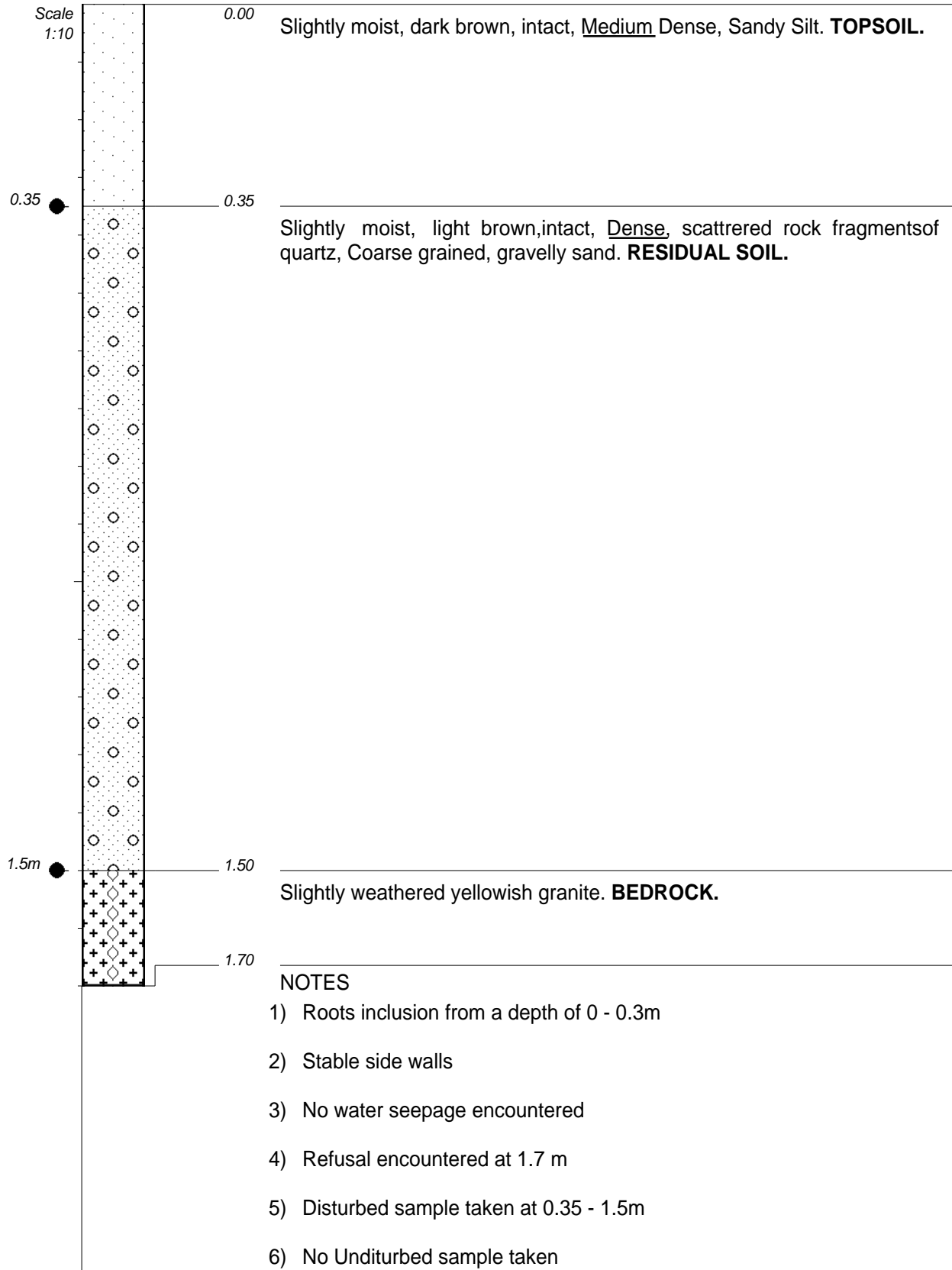
ELEVATION : 446m
 X-COORD : 31°18'22.17"E
 Y-COORD : 24°46'53.91"S



Nkanivo Development Consultant
Phase 1 Near surface geotechnical investigation

HOLE No: TP 19A
Sheet 1 of 1

JOB NUMBER: 000



CONTRACTOR :
MACHINE : Tractor Loader Backhoe (TLB).
DRILLED BY :
PROFILED BY : Mavhetha Lavhelesani
TYPE SET BY : Mavhetha Lavhelesani
SETUP FILE : STANDARD.SET

INCLINATION :
DIAM : 0.7 m
DATE :
DATE : 13/11/2020
DATE : 30/05/2021 21:59
TEXT : ..00\Examples\Examples.TXT

ELEVATION : 432m
X-COORD : 31°18'27.14"E
Y-COORD : 24°46'55.37"S

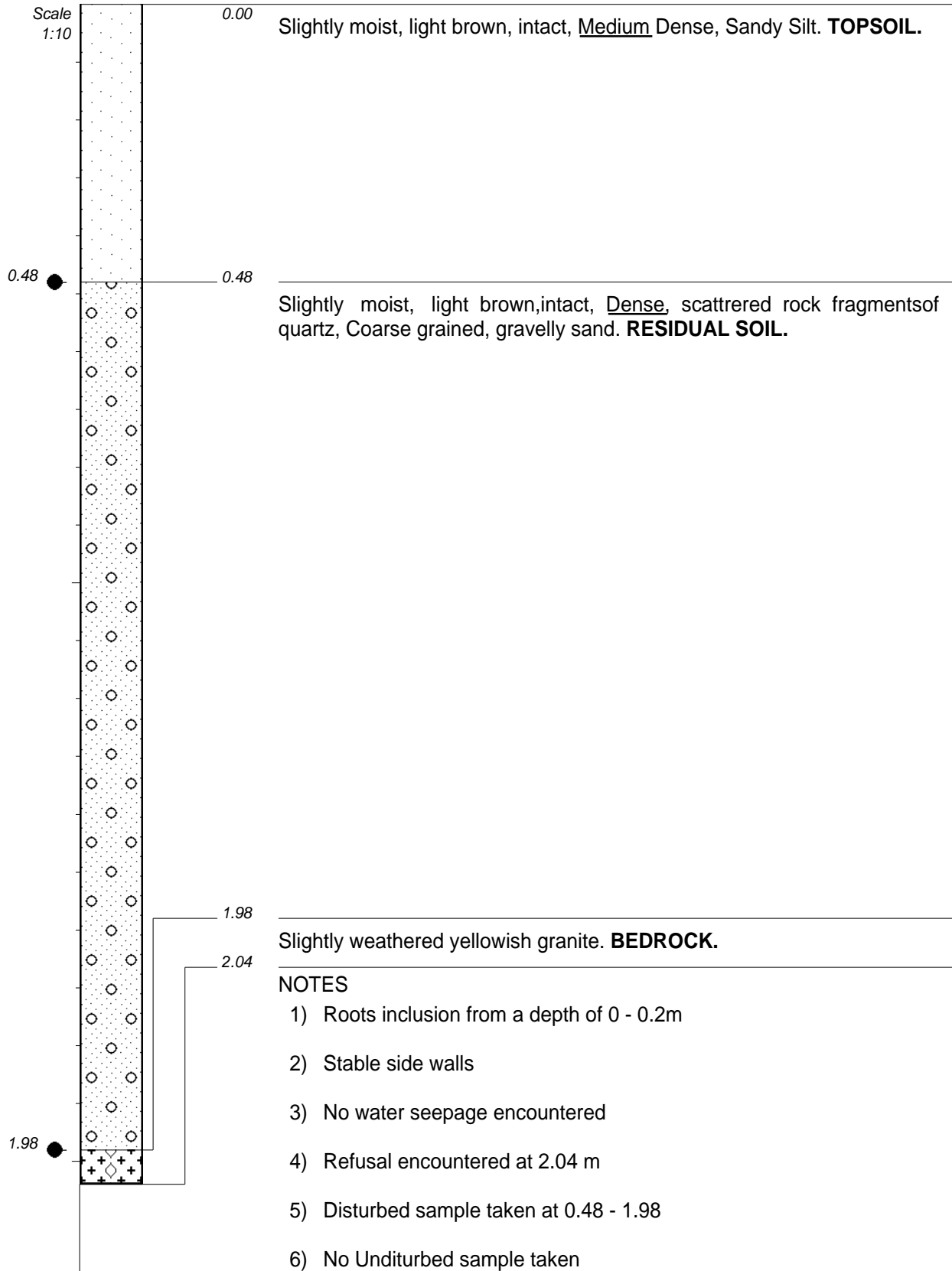
HOLE No: TP 19A



Nkanivo Development Consultant
Phase 1 Near surface geotechnical investigation

HOLE No: TP 20A
Sheet 1 of 1

JOB NUMBER: 000



CONTRACTOR :
MACHINE : Tractor Loader Backhoe (TLB).
DRILLED BY :
PROFILED BY : Mavhetha Lavhelesani
TYPE SET BY : Mavhetha Lavhelesani
SETUP FILE : STANDARD.SET

INCLINATION :
DIAM : 0.7 m
DATE :
DATE : 13/11/2020
DATE : 30/05/2021 21:59
TEXT : ..00\Examples\Examples.TXT

ELEVATION : 430m
X-COORD : 31°18'21.98"E
Y-COORD : 24°46'56.54"S

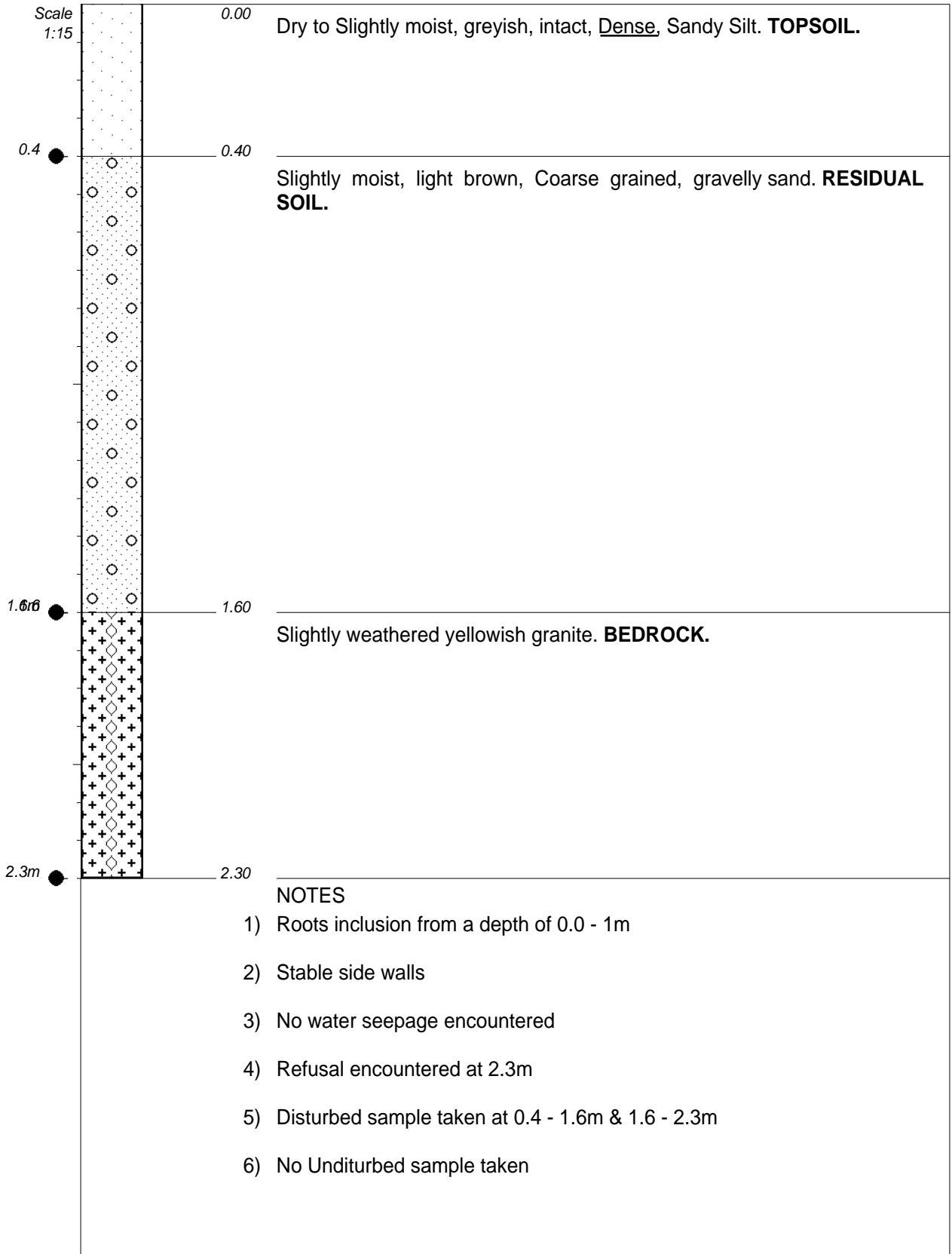
HOLE No: TP 20A



**Nkanivo Development Consultant
Phase 1 Near surface geotechnical investigation**

HOLE No: TP 01
Sheet 1 of 1

JOB NUMBER: 000



CONTRACTOR :
MACHINE : Tractor Loader Backhoe (TLB).
DRILLED BY :
PROFILED BY : Mavhetha Lavhelesani
TYPE SET BY : Mavhetha Lavhelesani
SETUP FILE : STANDARD.SET

INCLINATION :
DIAM : 0.7 m
DATE :
DATE : 13/11/2020
DATE : 30/05/2021 21:59
TEXT : ..00\Examples\Examples.TXT

ELEVATION : 434m
X-COORD : 31°18'40.4"E
Y-COORD : 24°47'11.2"S

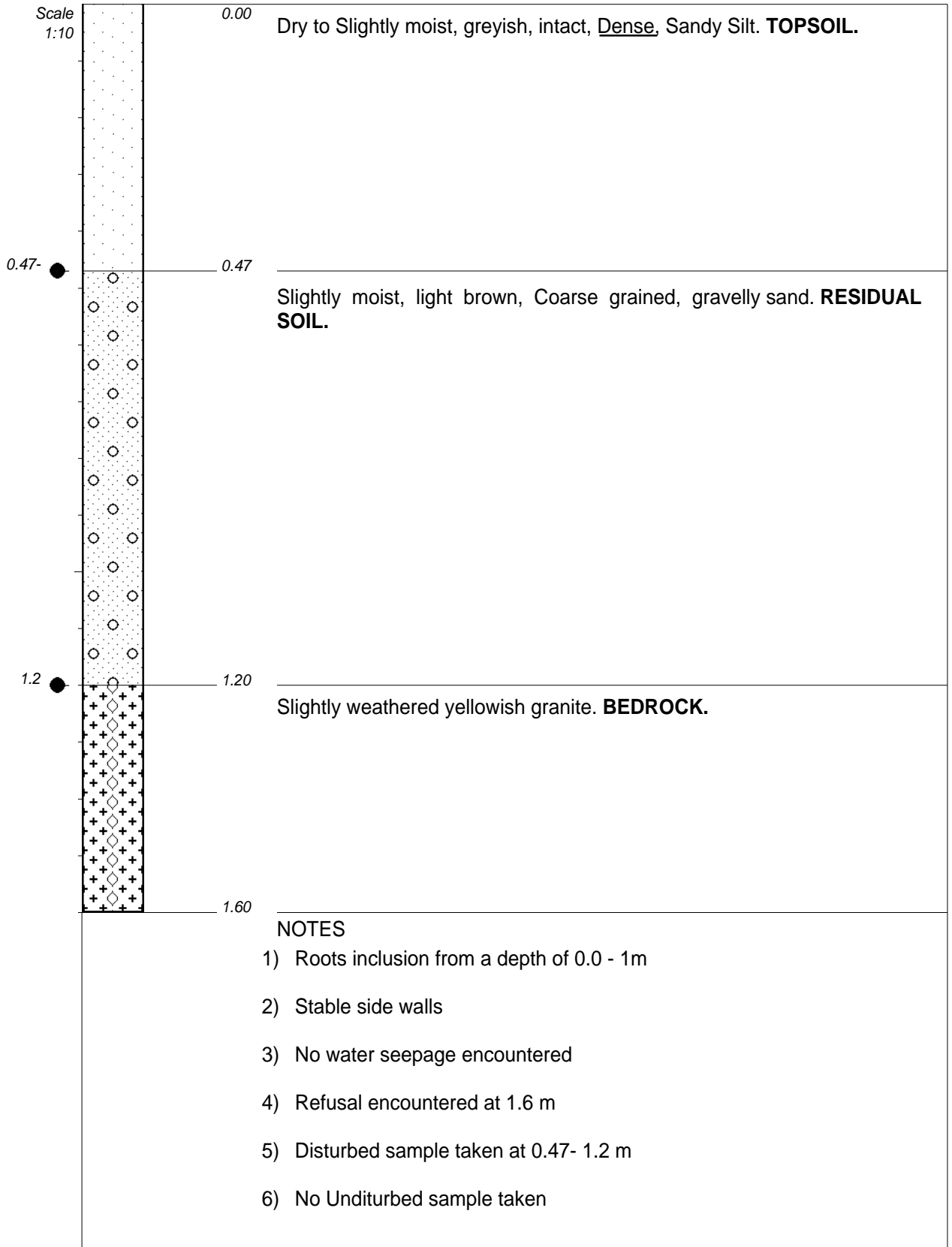
HOLE No: TP 01



Nkanivo Development Consultant
Phase 1 Near surface geotechnical investigation

HOLE No: TP 02
Sheet 1 of 1

JOB NUMBER: 000



CONTRACTOR :
MACHINE : Tractor Loader Backhoe (TLB).
DRILLED BY :
PROFILED BY : Mavhetha Lavhelesani

INCLINATION :
DIAM : 0.7 m
DATE :
DATE : 13/11/2020

ELEVATION : 437m
X-COORD : 31°18'34.91"E
Y-COORD : 24°47'9.19"S

TYPE SET BY : Mavhetha Lavhelesani
SETUP FILE : STANDARD.SET

DATE : 30/05/2021 21:59
TEXT : ..00\Examples\Examples.TXT

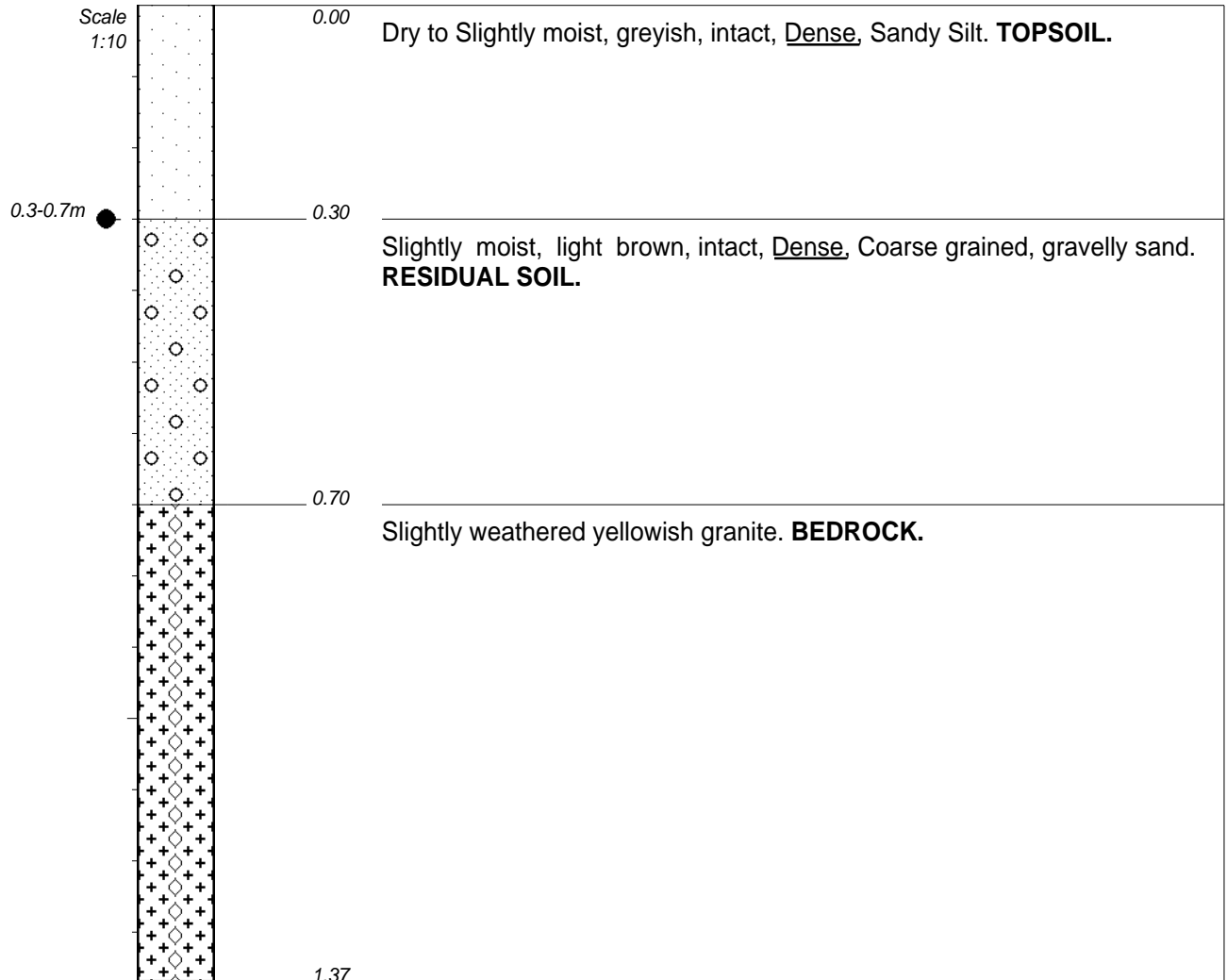
HOLE No: TP 02



**Nkanivo Development Consultant
Phase 1 Near surface geotechnical investigation**

HOLE No: TP 03
Sheet 1 of 1

JOB NUMBER: 000



NOTES

- 1) Roots inclusion from a depth of 0.0 - 0.5m
- 2) Stable side walls
- 3) No water seepage encountered
- 4) Refusal encountered at 1.37 m
- 5) Disturbed sample taken at 0.3-0.7m
- 6) No Undisturbed sample taken

CONTRACTOR :

MACHINE : Tractor Loader Backhoe (TLB).

DRILLED BY :

PROFILED BY : Mavhetha Lavhelesani

TYPE SET BY : Mavhetha Lavhelesani

SETUP FILE : STANDARD.SET

INCLINATION :

DIAM : 0.7 m

DATE :

DATE : 13/11/2020

DATE : 30/05/2021 21:59

TEXT : ..00\Examples\Examples.TXT

ELEVATION : 430m

X-COORD : 31°18'33.61"E

Y-COORD : 24°47'5.73"S

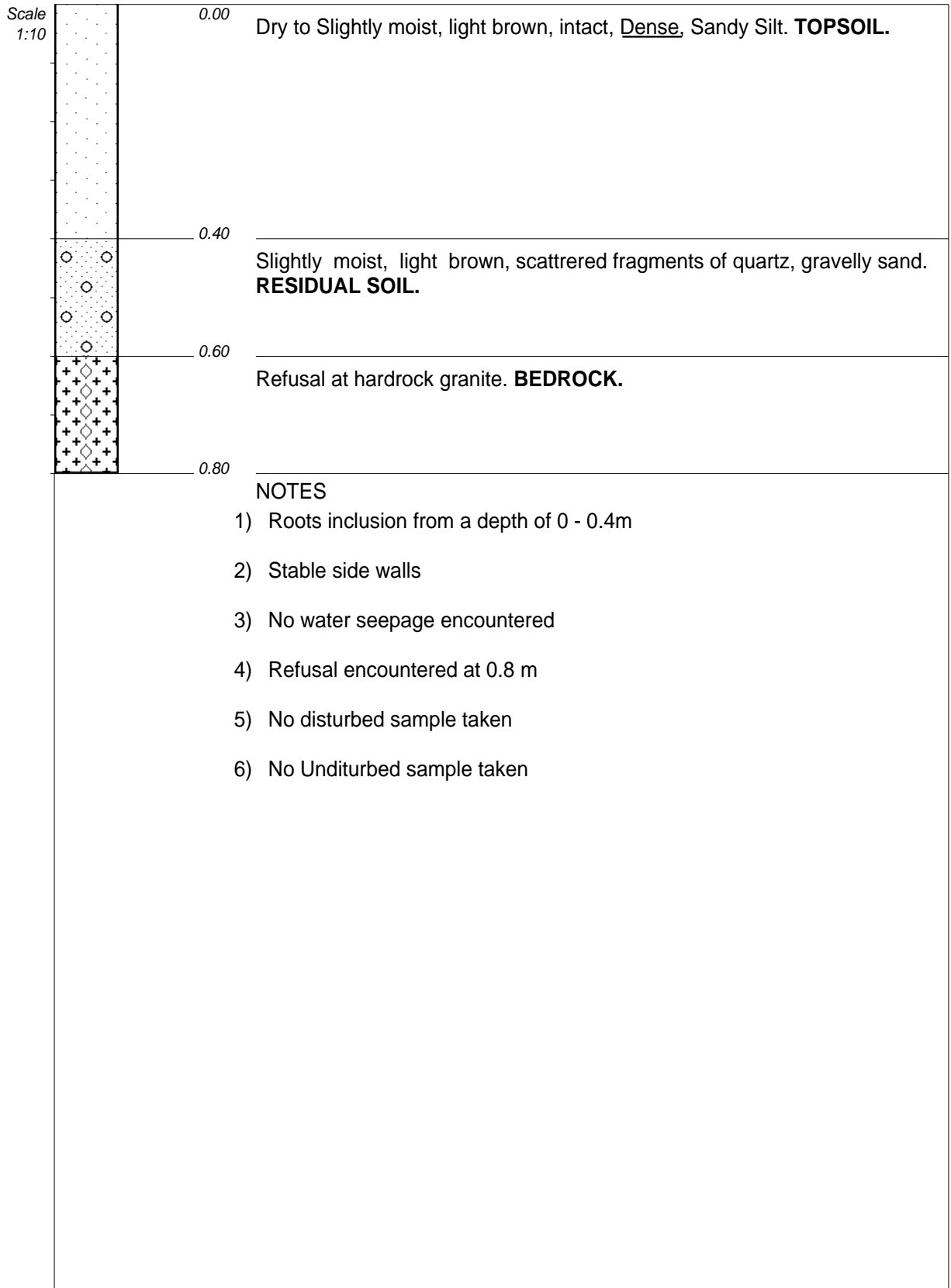
HOLE No: TP 03



**Nkanivo Development Consultant
Phase 1 Near surface geotechnical investigation**

HOLE No: TP 04
Sheet 1 of 1

JOB NUMBER: 000



CONTRACTOR :

MACHINE : Tractor Loader Backhoe (TLB).

DRILLED BY :

PROFILED BY : Mavhetha Lavhelesani

TYPE SET BY : Mavhetha Lavhelesani

SETUP FILE : STANDARD.SET

INCLINATION :

DIAM : 0.7 m

DATE :

DATE : 13/11/2020

DATE : 30/05/2021 21:59

TEXT : ..00\Examples\Examples.TXT

ELEVATION : 431m

X-COORD : 31°18'36.88"E

Y-COORD : 24°47'3.96"S

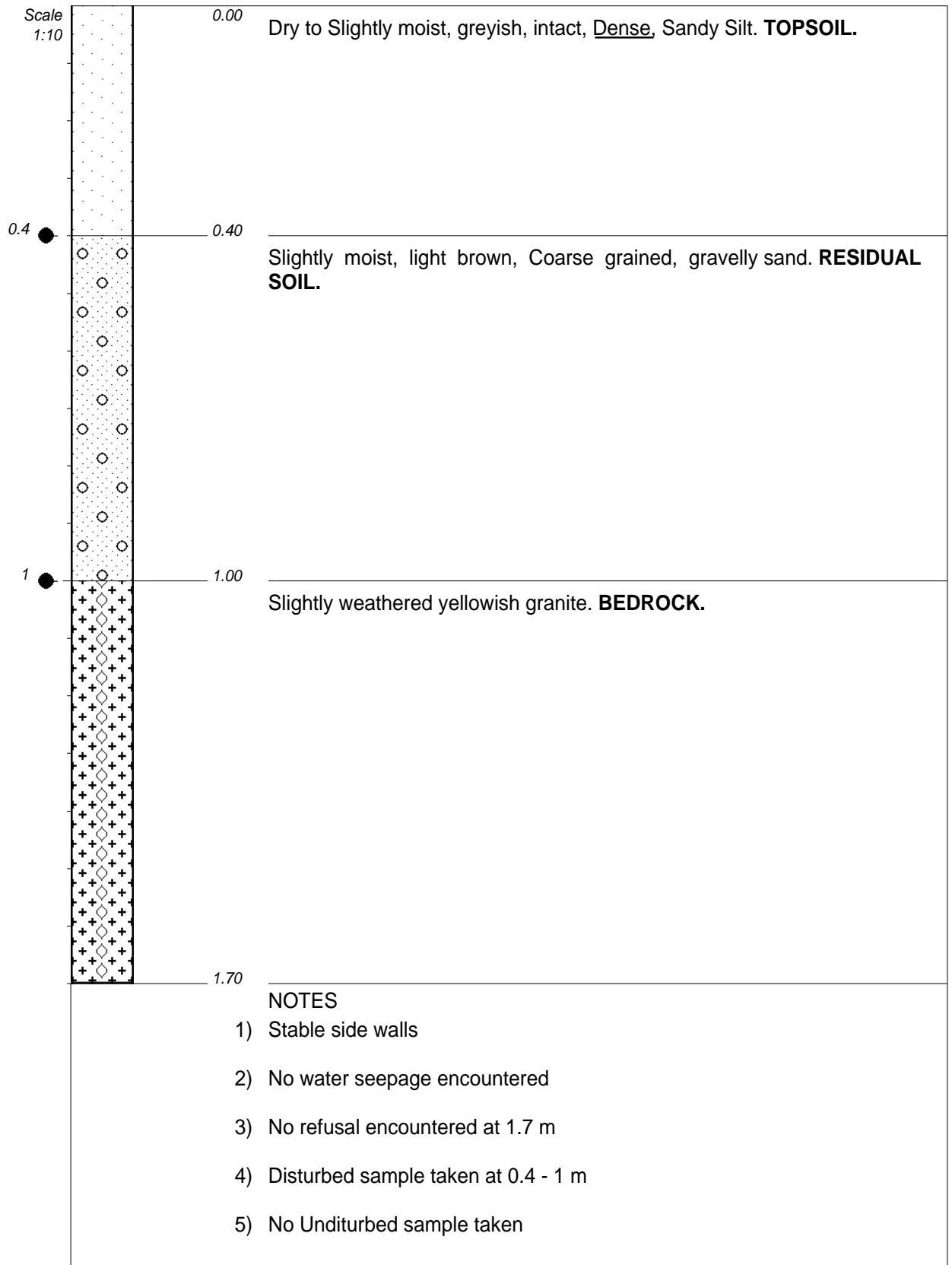
HOLE No: TP 04



**Nkanivo Development Consultant
Phase 1 Near surface geotechnical investigation**

HOLE No: TP 05
Sheet 1 of 1

JOB NUMBER: 000



CONTRACTOR :

MACHINE : Tractor Loader Backhoe (TLB).

DRILLED BY :

PROFILED BY : Mavhetha Lavhelesani

TYPE SET BY : Mavhetha Lavhelesani

SETUP FILE : STANDARD.SET

INCLINATION :

DIAM : 0.7 m

DATE :

DATE : 13/11/2020

DATE : 30/05/2021 21:59

TEXT : ..00\Examples\Examples.TXT

ELEVATION : 436m

X-COORD : 31°18'41.65"E

Y-COORD : 24°47'6.13"S

HOLE No: TP 05

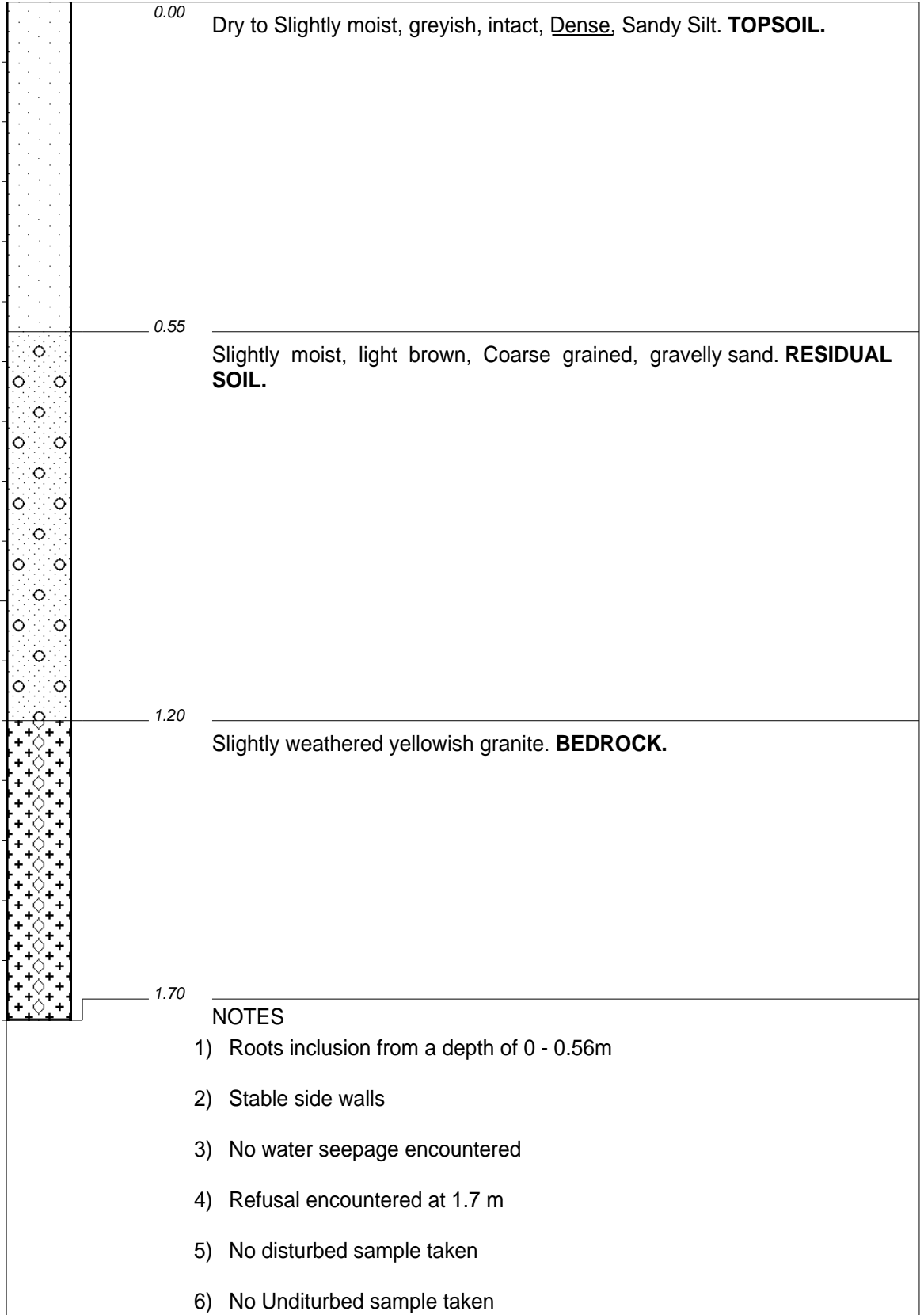


Nkanivo Development Consultant
Phase 1 Near surface geotechnical investigation

HOLE No: TP 06
Sheet 1 of 1

JOB NUMBER: 000

Scale
1:10



CONTRACTOR :

MACHINE : Tractor Loader Backhoe (TLB).

DRILLED BY :

PROFILED BY : Mavhetha Lavhelesani

TYPE SET BY : Mavhetha Lavhelesani

SETUP FILE : STANDARD.SET

INCLINATION :

DIAM : 0.7 m

DATE :

DATE : 13/11/2020

DATE : 30/05/2021 21:59

TEXT : ..00\Examples\Examples.TXT

ELEVATION : 440m

X-COORD : 31°18'41.69"E

Y-COORD : 24°47'9.04"S

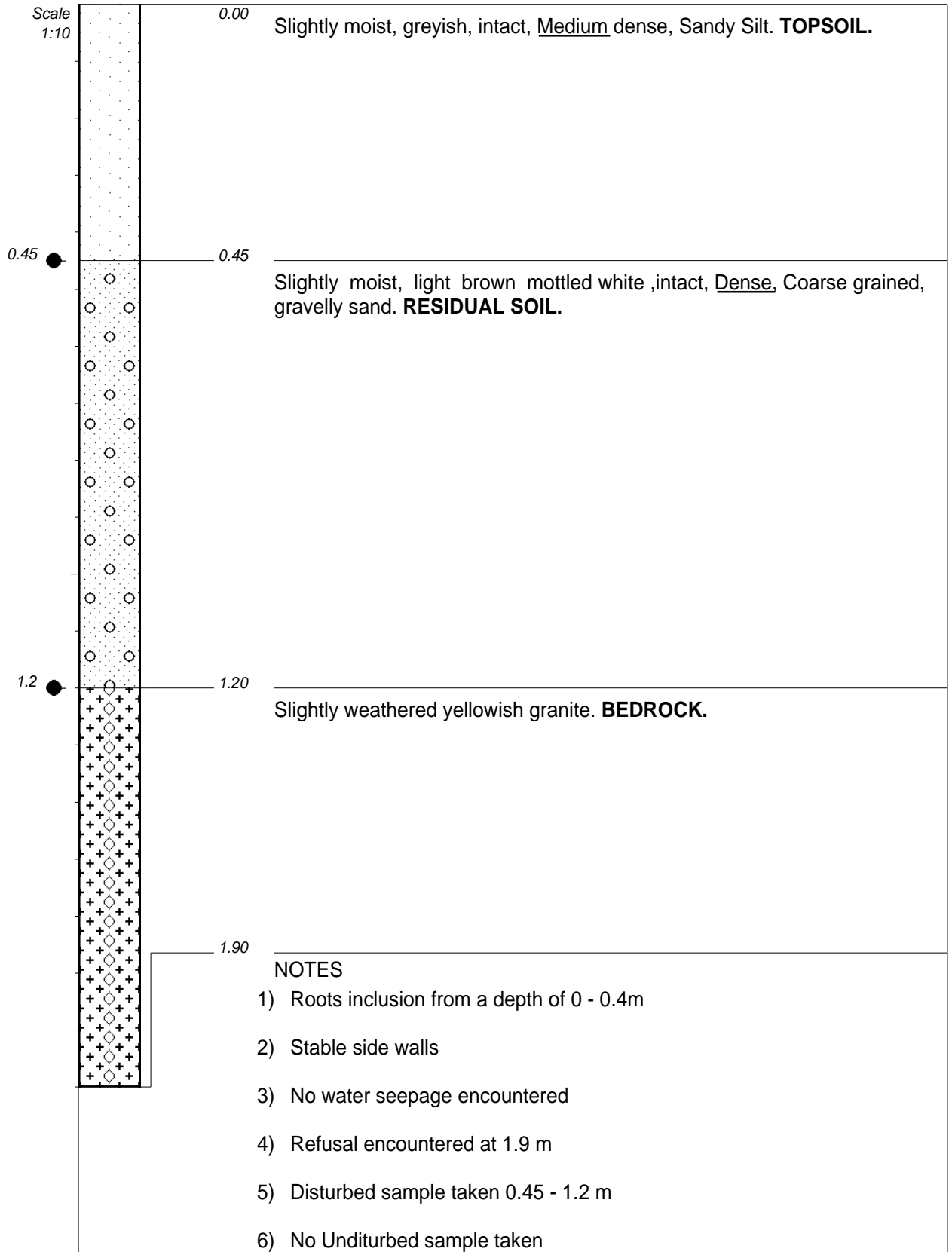
HOLE No: TP 06



Nkanivo Development Consultant
Phase 1 Near surface geotechnical investigation

HOLE No: TP 07
Sheet 1 of 1

JOB NUMBER: 000



CONTRACTOR :
MACHINE : Tractor Loader Backhoe (TLB).
DRILLED BY :
PROFILED BY : Mavhetha Lavhelesani

INCLINATION :
DIAM : 0.7 m
DATE :
DATE : 13/11/2020

ELEVATION : 428m
X-COORD : 31°18'45.49"E
Y-COORD : 24°47'6.27"S

TYPE SET BY : Mavhetha Lavhelesani
SETUP FILE : STANDARD.SET

DATE : 30/05/2021 21:59
TEXT : ..00\Examples\Examples.TXT

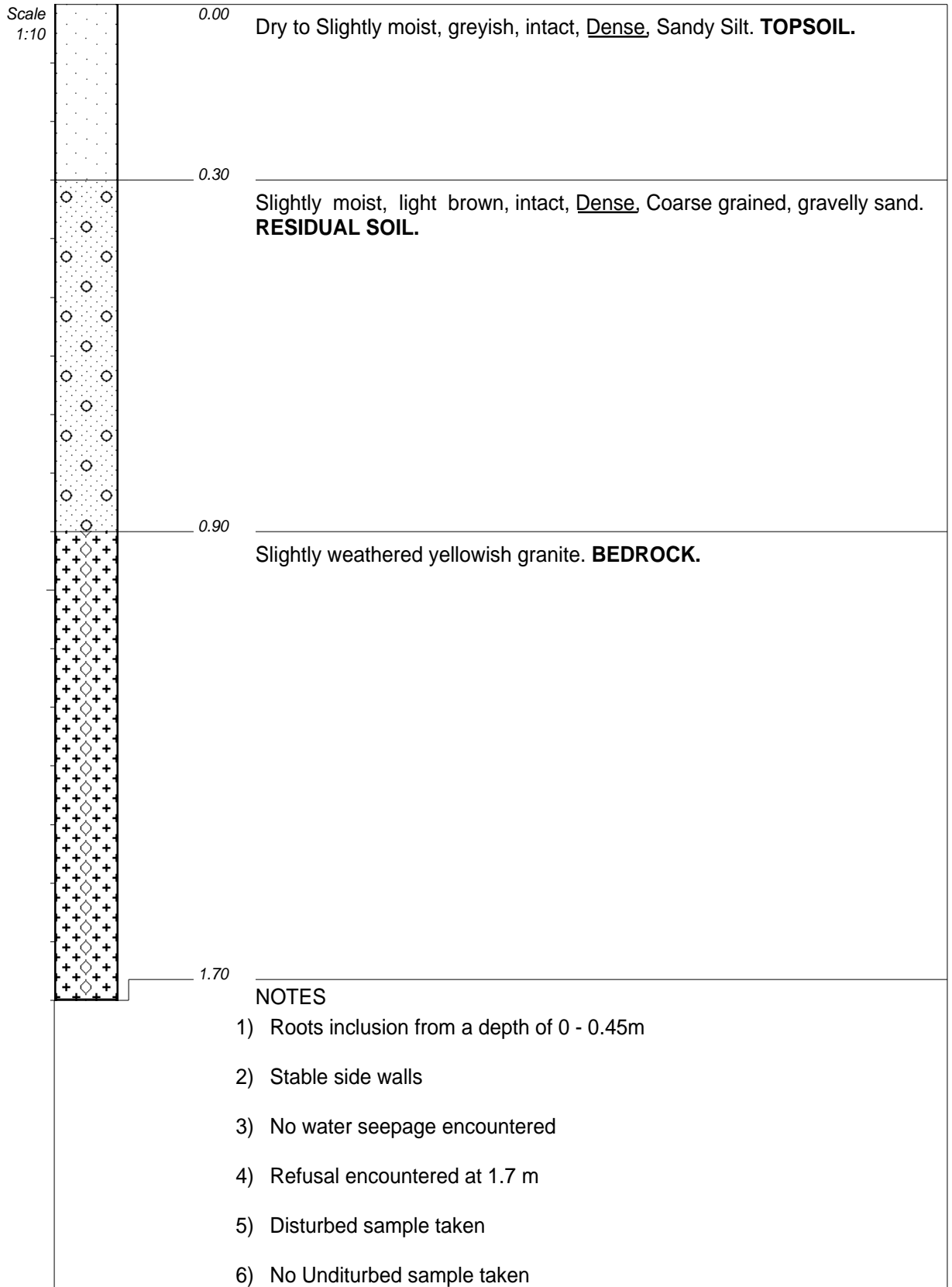
HOLE No: TP 07



Nkanivo Development Consultant
Phase 1 Near surface geotechnical investigation

HOLE No: TP 08
Sheet 1 of 1

JOB NUMBER: 000



CONTRACTOR :
MACHINE : Tractor Loader Backhoe (TLB).
DRILLED BY :
PROFILED BY : Mavhetha Lavhelesani

INCLINATION :
DIAM : 0.7 m
DATE :
DATE : 13/11/2020

ELEVATION : 440m
X-COORD : 31°18'46.87"E
Y-COORD : 24°47'4.46"S

TYPE SET BY : Mavhetha Lavhelesani
SETUP FILE : STANDARD.SET

DATE : 30/05/2021 21:59
TEXT : ..00\Examples\Examples.TXT

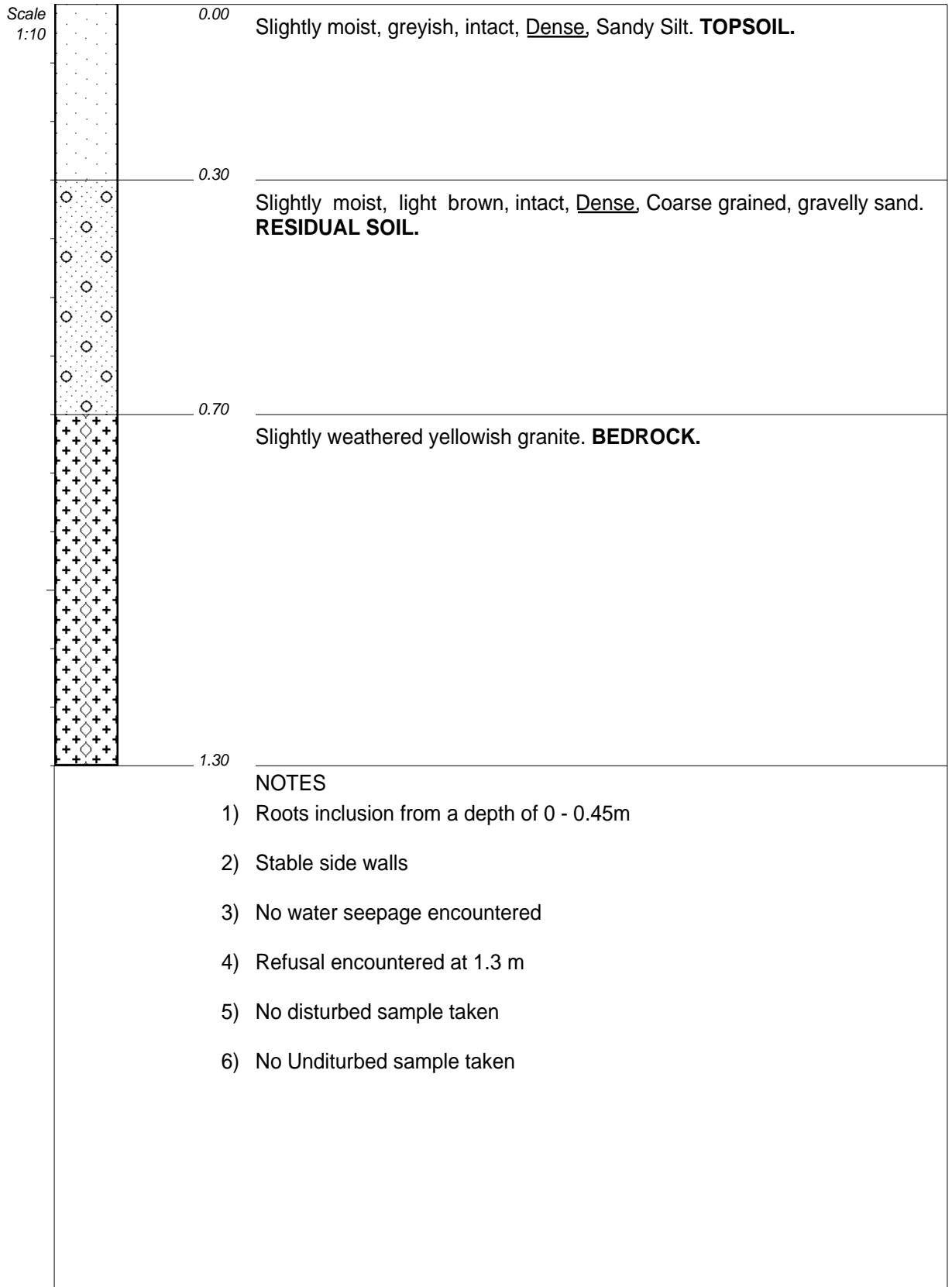
HOLE No: TP 08



Nkanivo Development Consultant
Phase 1 Near surface geotechnical investigation

HOLE No: TP 09
Sheet 1 of 1

JOB NUMBER: 000



CONTRACTOR :

MACHINE : Tractor Loader Backhoe (TLB).

DRILLED BY :

PROFILED BY : Mavhetha Lavhelesani

TYPE SET BY : Mavhetha Lavhelesani

SETUP FILE : STANDARD.SET

INCLINATION :

DIAM : 0.7 m

DATE :

DATE : 13/11/2020

DATE : 30/05/2021 21:59

TEXT : ..00\Examples\Examples.TXT

ELEVATION : 437m

X-COORD : 31°18'39.73"E

Y-COORD : 24°47'0.89"S

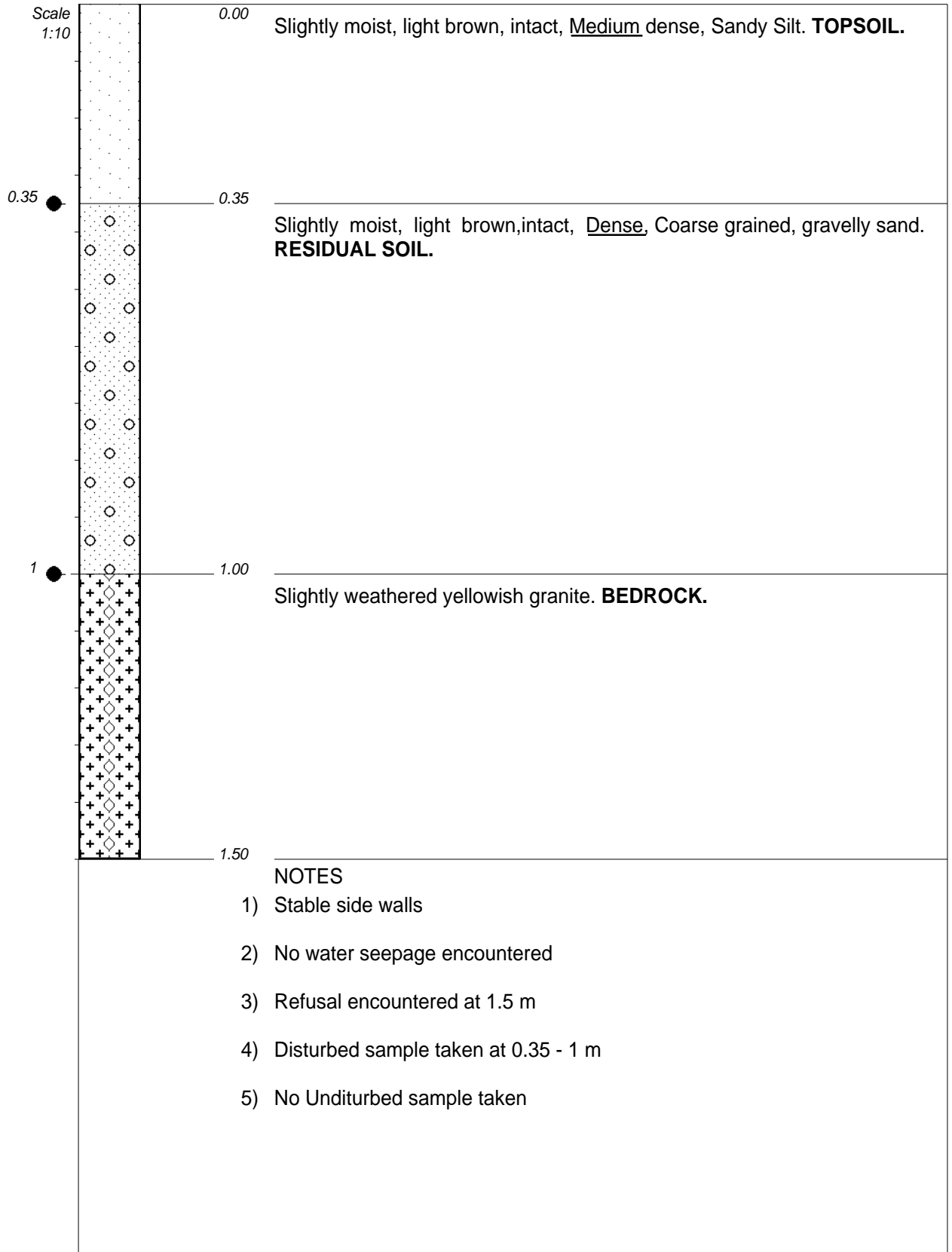
HOLE No: TP 09



Nkanivo Development Consultant
Phase 1 Near surface geotechnical investigation

HOLE No: TP 10
Sheet 1 of 1

JOB NUMBER: 000



CONTRACTOR :

MACHINE : Tractor Loader Backhoe (TLB).

DRILLED BY :

PROFILED BY : Mavhetha Lavhelesani

TYPE SET BY : Mavhetha Lavhelesani

SETUP FILE : STANDARD.SET

INCLINATION :

DIAM : 0.7 m

DATE :

DATE : 13/11/2020

DATE : 30/05/2021 21:59

TEXT : ..00\Examples\Examples.TXT

ELEVATION : 435m

X-COORD : 31°18'41.88"E

Y-COORD : 24°46'58.75"S

HOLE No: TP 10

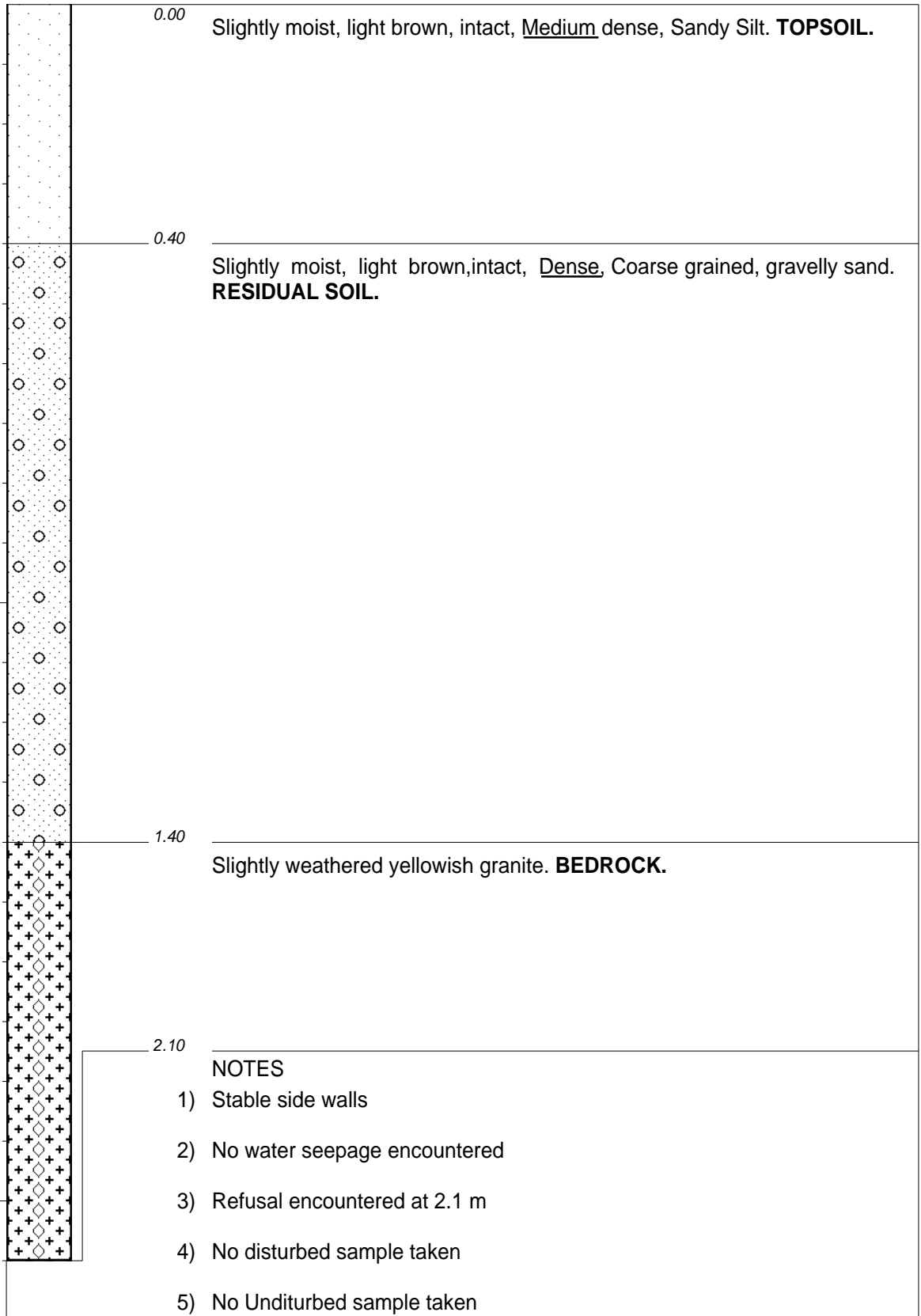


Nkanivo Development Consultant
Phase 1 Near surface geotechnical investigation

HOLE No: TP 11
Sheet 1 of 1

JOB NUMBER: 000

Scale
1:10



CONTRACTOR :

MACHINE : Tractor Loader Backhoe (TLB).

DRILLED BY :

PROFILED BY : Mavhetha Lavhelesani

TYPE SET BY : Mavhetha Lavhelesani

SETUP FILE : STANDARD.SET

INCLINATION :

DIAM : 0.7 m

DATE :

DATE : 13/11/2020

DATE : 30/05/2021 21:59

TEXT : ..00\Examples\Examples.TXT

ELEVATION : 442m

X-COORD : 31°18'46.85"E

Y-COORD : 24°46'55.7"S

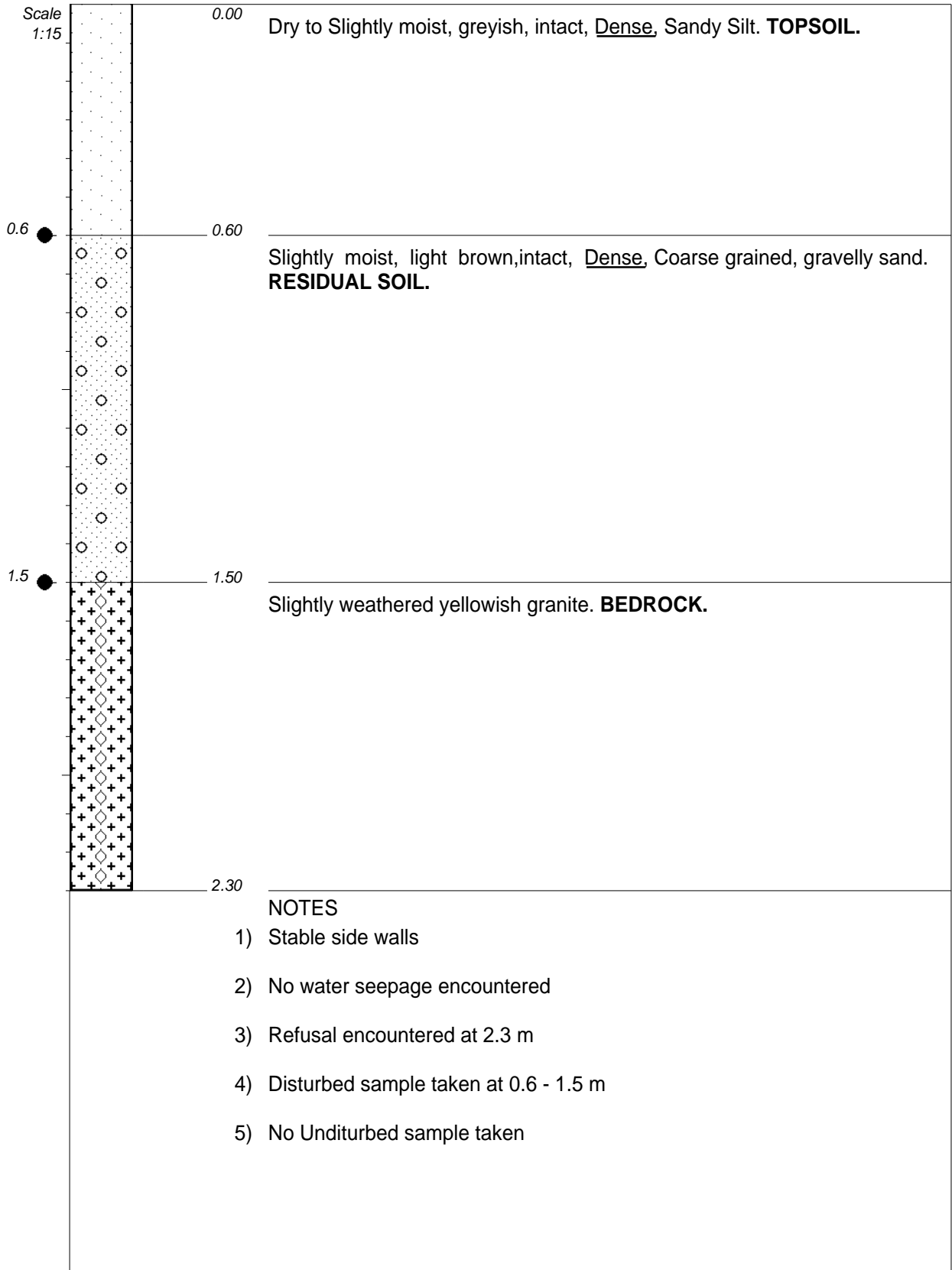
HOLE No: TP 11



Nkanivo Development Consultant
Phase 1 Near surface geotechnical investigation

HOLE No: TP 12
Sheet 1 of 1

JOB NUMBER: 000



CONTRACTOR :

MACHINE : Tractor Loader Backhoe (TLB).

DRILLED BY :

PROFILED BY : Mavhetha Lavhelesani

TYPE SET BY : Mavhetha Lavhelesani

SETUP FILE : STANDARD.SET

INCLINATION :

DIAM : 0.7 m

DATE :

DATE : 13/11/2020

DATE : 30/05/2021 21:59

TEXT : ..00\Examples\Examples.TXT

ELEVATION : 436m

X-COORD : 31°18'51.02"E

Y-COORD : 24°46'51.98"S

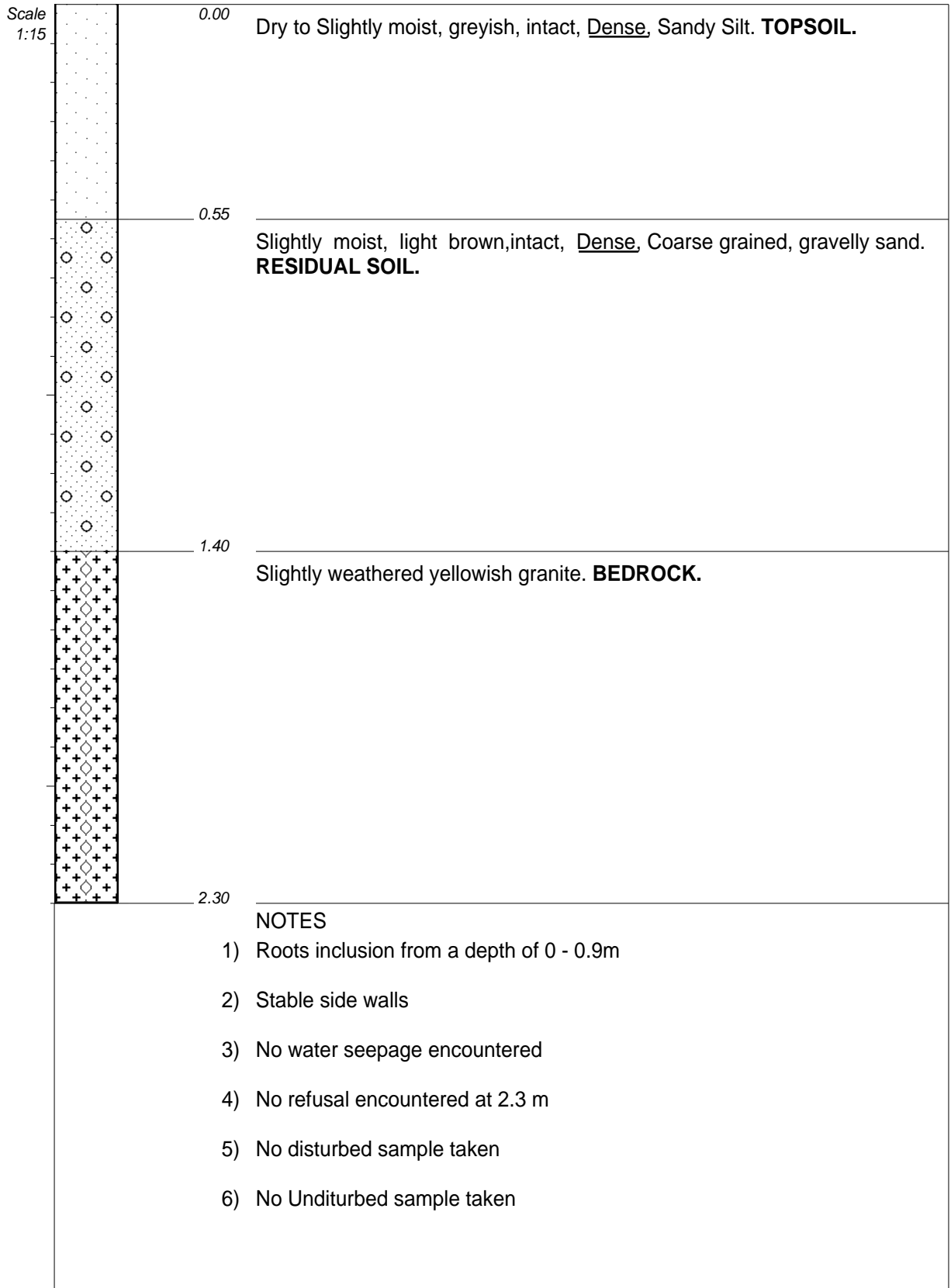
HOLE No: TP 12



Nkanivo Development Consultant
Phase 1 Near surface geotechnical investigation

HOLE No: TP 13
Sheet 1 of 1

JOB NUMBER: 000



CONTRACTOR :
MACHINE : Tractor Loader Backhoe (TLB).
DRILLED BY :
PROFILED BY : Mavhetha Lavhelesani

INCLINATION :
DIAM : 0.7 m
DATE :
DATE : 13/11/2020

ELEVATION : 438m
X-COORD : 31°18'56.7"E
Y-COORD : 24°46'45.52"S

TYPE SET BY : Mavhetha Lavhelesani
SETUP FILE : STANDARD.SET

DATE : 30/05/2021 21:59
TEXT : ..00\Examples\Examples.TXT

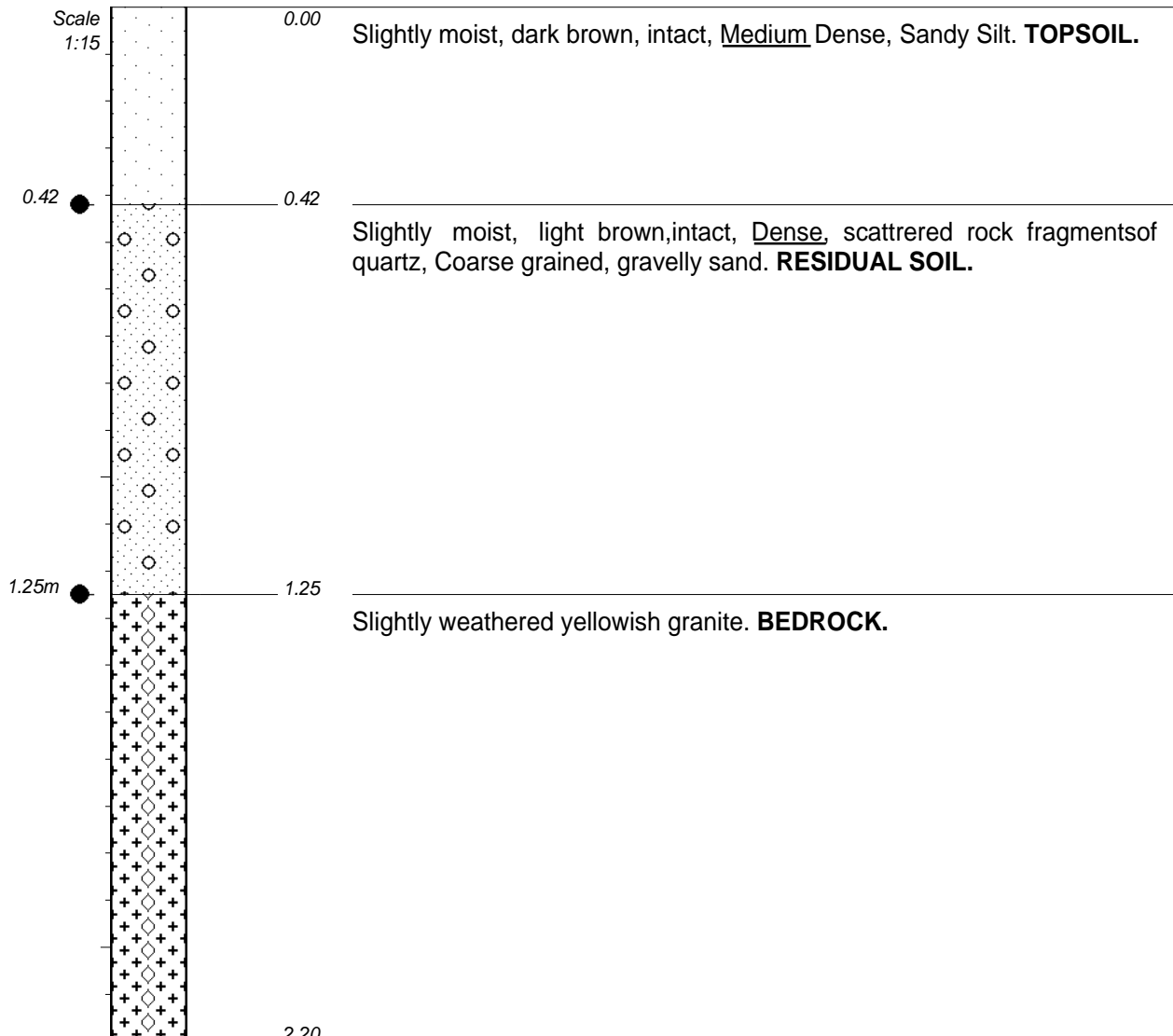
HOLE No: TP 13



Nkanivo Development Consultant
Phase 1 Near surface geotechnical investigation

HOLE No: TP 14
Sheet 1 of 1

JOB NUMBER: 000



NOTES

- 1) Stable side walls
- 2) No water seepage encountered
- 3) Refusal encountered at 2.2 m
- 4) Disturbed sample taken at 0.42 - 1.25m
- 5) No Undisturbed sample taken

CONTRACTOR :
MACHINE : Tractor Loader Backhoe (TLB).
DRILLED BY :
PROFILED BY : Mavhetha Lavhelesani
TYPE SET BY : Mavhetha Lavhelesani
SETUP FILE : STANDARD.SET

INCLINATION :
DIAM : 0.7 m
DATE :
DATE : 13/11/2020
DATE : 30/05/2021 21:59
TEXT : ..00\Examples\Examples.TXT

ELEVATION : 439m
X-COORD : 31°18'59.40"E
Y-COORD : 24°46'45"S

HOLE No: TP 14

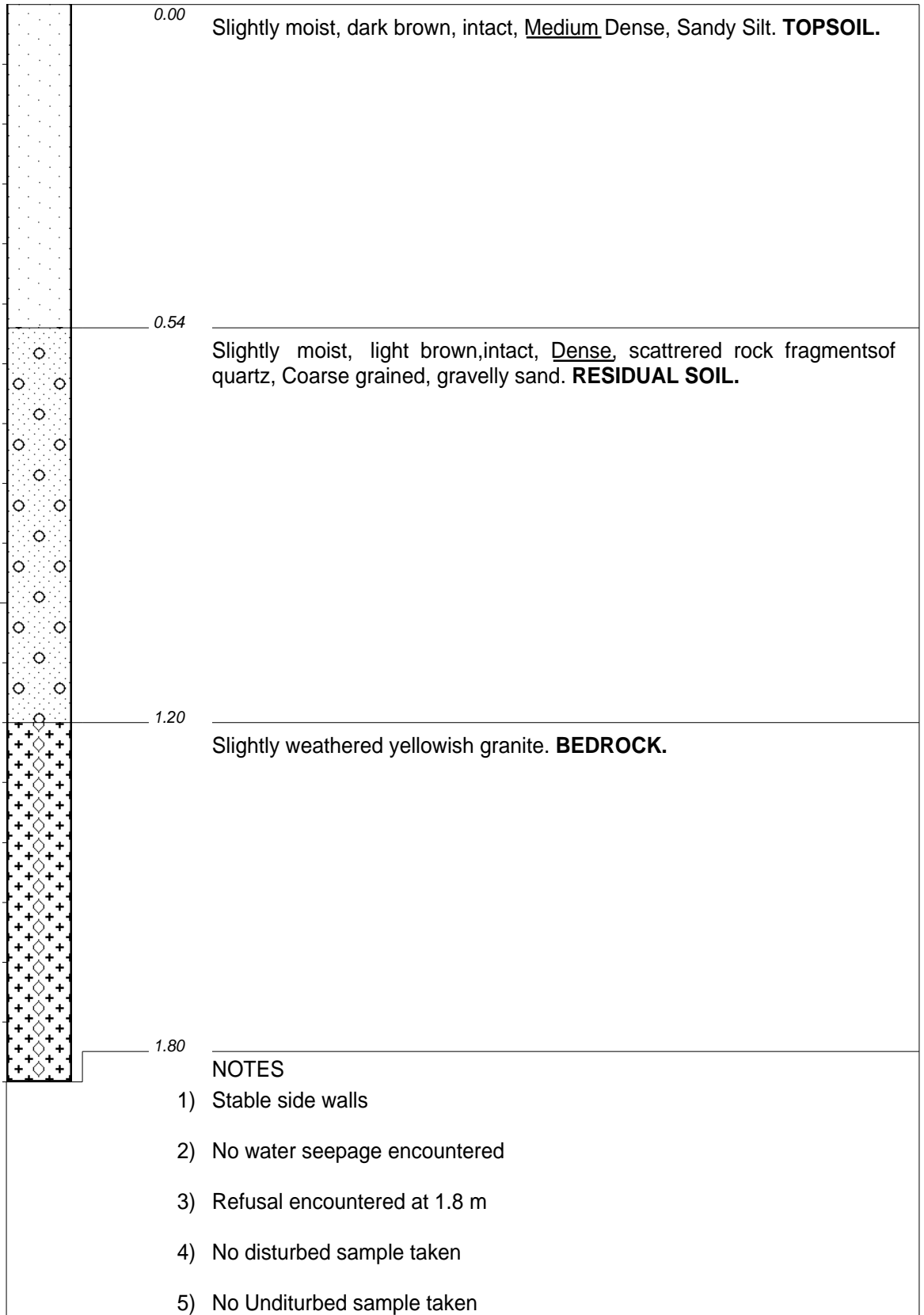


Nkanivo Development Consultant
Phase 1 Near surface geotechnical investigation

HOLE No: TP 15
Sheet 1 of 1

JOB NUMBER: 000

Scale
1:10



CONTRACTOR :

MACHINE : Tractor Loader Backhoe (TLB).

DRILLED BY :

PROFILED BY : Mavhetha Lavhelesani

TYPE SET BY : Mavhetha Lavhelesani

SETUP FILE : STANDARD.SET

INCLINATION :

DIAM : 0.7 m

DATE :

DATE : 13/11/2020

DATE : 30/05/2021 21:59

TEXT : ..00\Examples\Examples.TXT

ELEVATION : 444m

X-COORD : 31°19'0.43"E

Y-COORD : 24°46'50.05"S

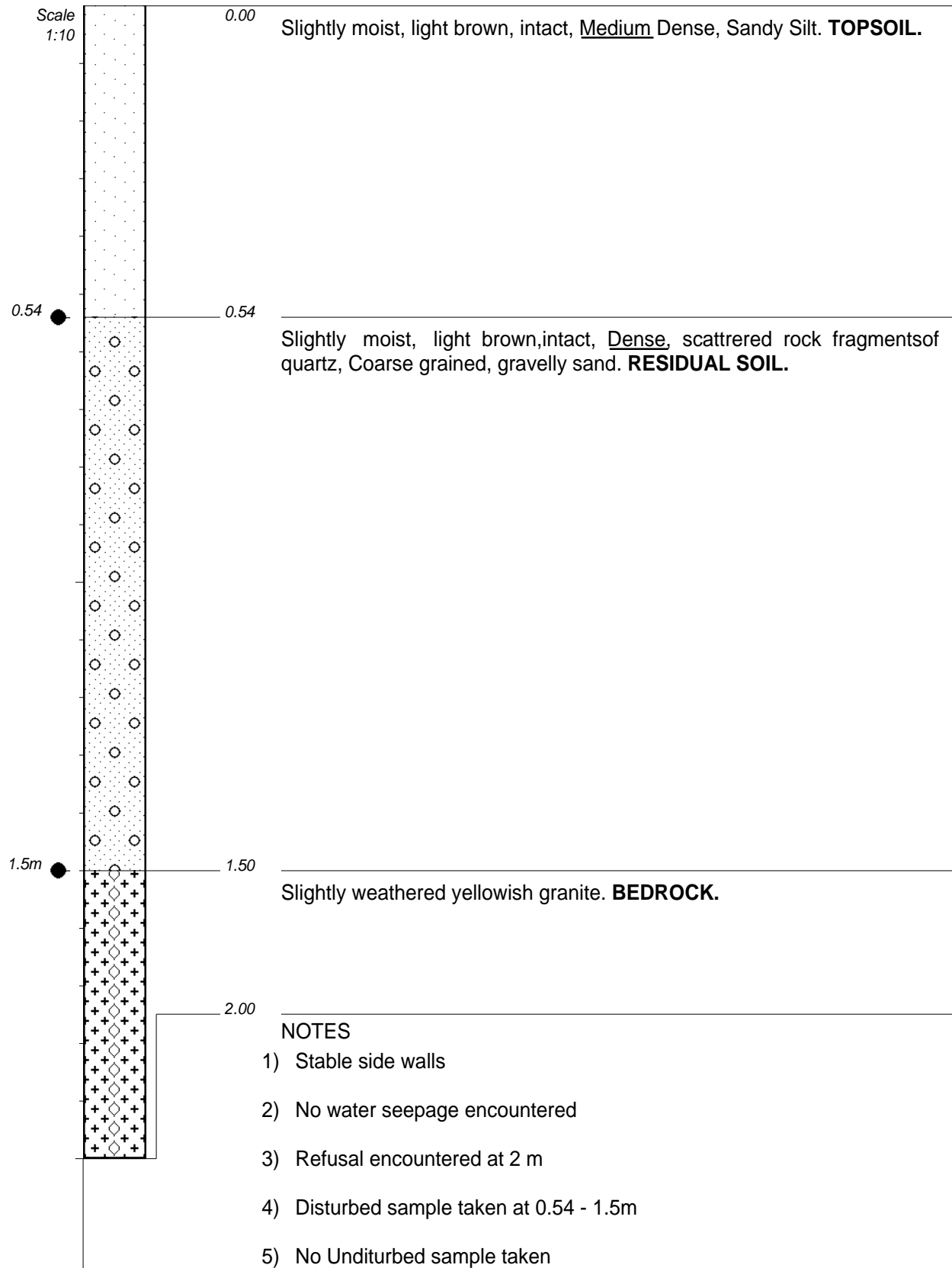
HOLE No: TP 15



**Nkanivo Development Consultant
Phase 1 Near surface geotechnical investigation**

HOLE No: TP 16
Sheet 1 of 1

JOB NUMBER: 000



CONTRACTOR :
MACHINE : Tractor Loader Backhoe (TLB).
DRILLED BY :
PROFILED BY : Mavhetha Lavhelesani
TYPE SET BY : Mavhetha Lavhelesani
SETUP FILE : STANDARD.SET

INCLINATION :
DIAM : 0.7 m
DATE :
DATE : 13/11/2020
DATE : 30/05/2021 21:59
TEXT : ..00\Examples\Examples.TXT

ELEVATION : 448m
X-COORD : 31°18'54.29"E
Y-COORD : 24°46'54.01"S

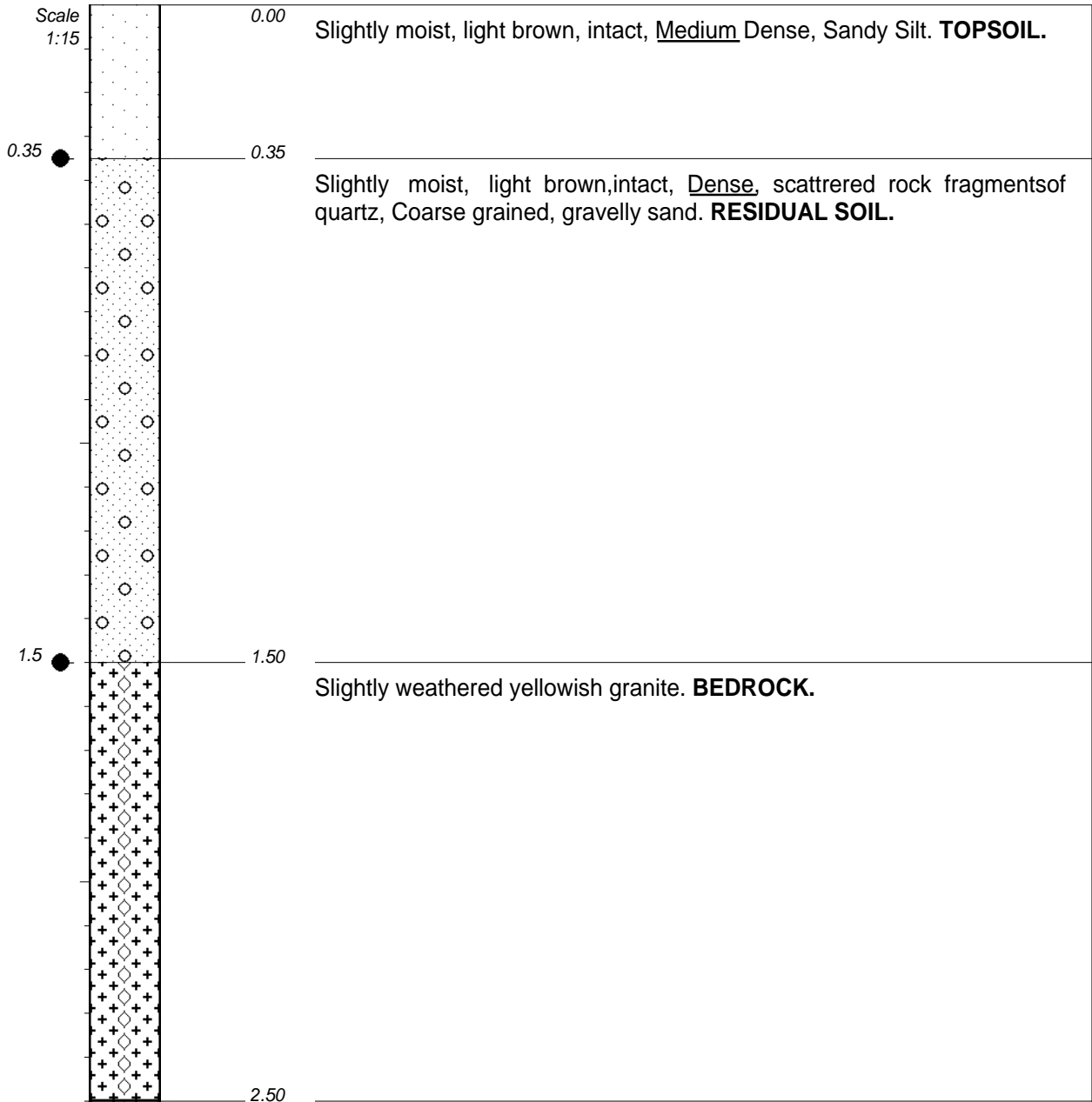
HOLE No: TP 16



Nkanivo Development Consultant
Phase 1 Near surface geotechnical investigation

HOLE No: TP 17
Sheet 1 of 1

JOB NUMBER: 000



- NOTES**
- 1) Stable side walls
 - 2) No water seepage encountered
 - 3) Refusal encountered at 2.5 m
 - 4) Disturbed sample taken at 0.35 - 1.5
 - 5) No Undisturbed sample taken

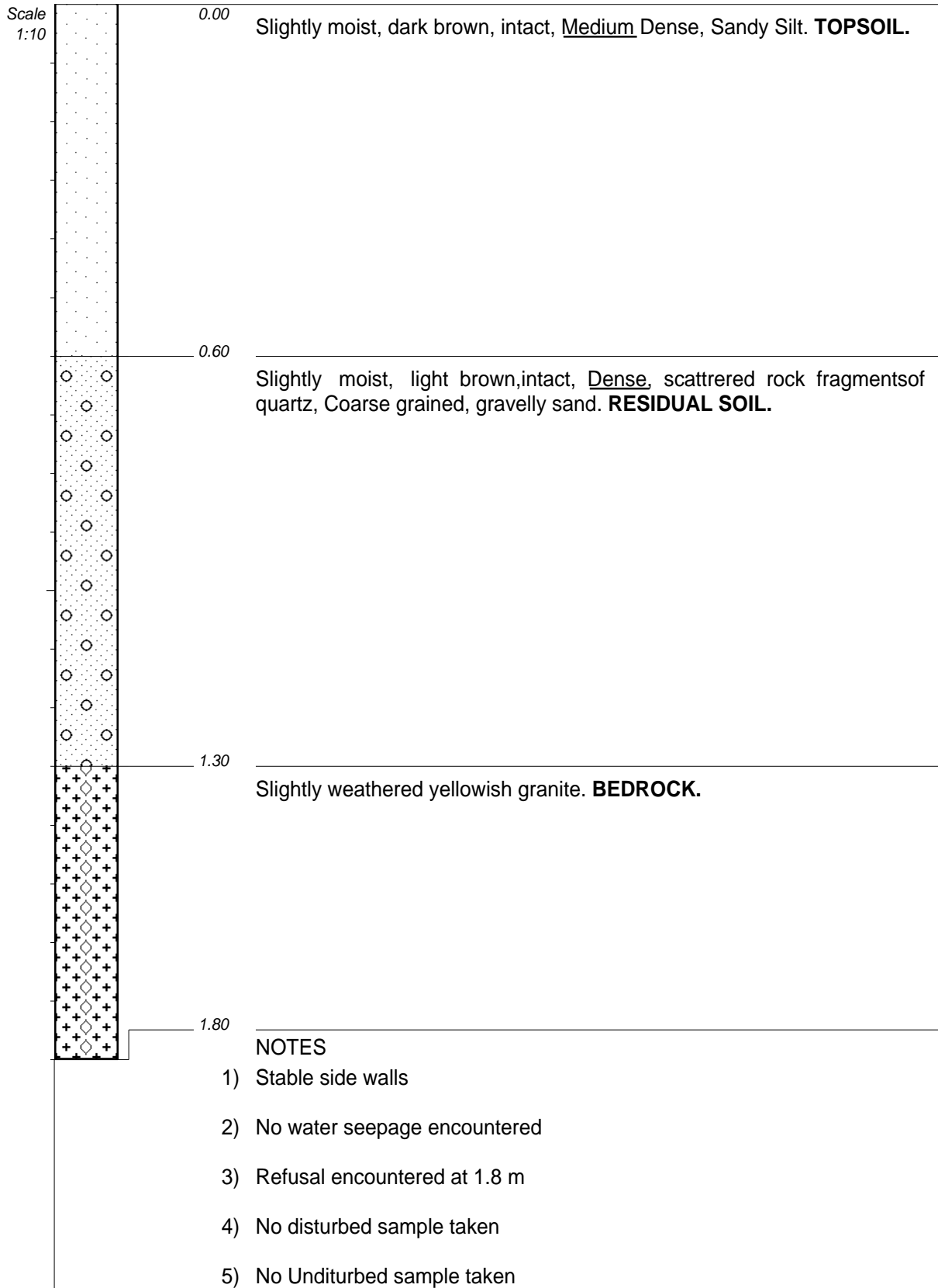
CONTRACTOR :	INCLINATION :	ELEVATION : 451m
MACHINE : Tractor Loader Backhoe (TLB).	DIAM : 0.7 m	X-COORD : 31°18'51.59"E
DRILLED BY :	DATE :	Y-COORD : 24°46'57.58"S
PROFILED BY : Mavhetha Lavhelesani	DATE : 13/11/2020	
TYPE SET BY : Mavhetha Lavhelesani	DATE : 30/05/2021 21:59	HOLE No: TP 17
SETUP FILE : STANDARD.SET	TEXT : ..00\Examples\Examples.TXT	



Nkanivo Development Consultant
Phase 1 Near surface geotechnical investigation

HOLE No: TP 18
Sheet 1 of 1

JOB NUMBER: 000



CONTRACTOR :

MACHINE : Tractor Loader Backhoe (TLB).

DRILLED BY :

PROFILED BY : Mavhetha Lavhelesani

TYPE SET BY : Mavhetha Lavhelesani

SETUP FILE : STANDARD.SET

INCLINATION :

DIAM : 0.7 m

DATE :

DATE : 13/11/2020

DATE : 30/05/2021 21:59

TEXT : ..00\Examples\Examples.TXT

ELEVATION : 446m

X-COORD : 31°18'48.97"E

Y-COORD : 24°47'2.26"S

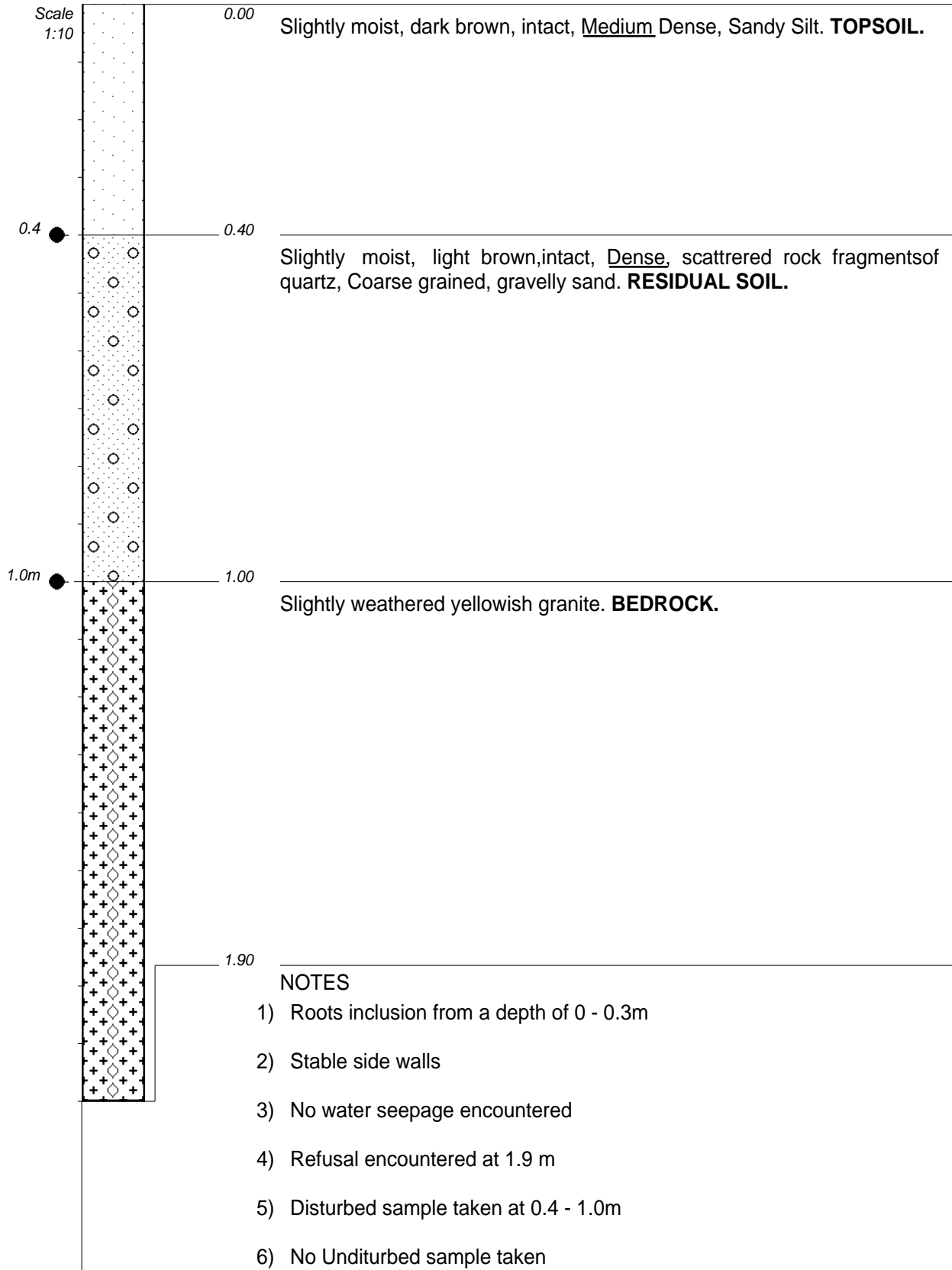
HOLE No: TP 18



Nkanivo Development Consultant
Phase 1 Near surface geotechnical investigation

HOLE No: TP 19
Sheet 1 of 1

JOB NUMBER: 000



CONTRACTOR :
 MACHINE : Tractor Loader Backhoe (TLB).
 DRILLED BY :
 PROFILED BY : Mavhetha Lavhelesani
 TYPE SET BY : Mavhetha Lavhelesani
 SETUP FILE : STANDARD.SET

INCLINATION :
 DIAM : 0.7 m
 DATE :
 DATE : 13/11/2020
 DATE : 30/05/2021 21:59
 TEXT : ..00\Examples\Examples.TXT

ELEVATION : 432m
 X-COORD : 31°19'7.23"E
 Y-COORD : 24°46'44.46"S

HOLE No: TP 19

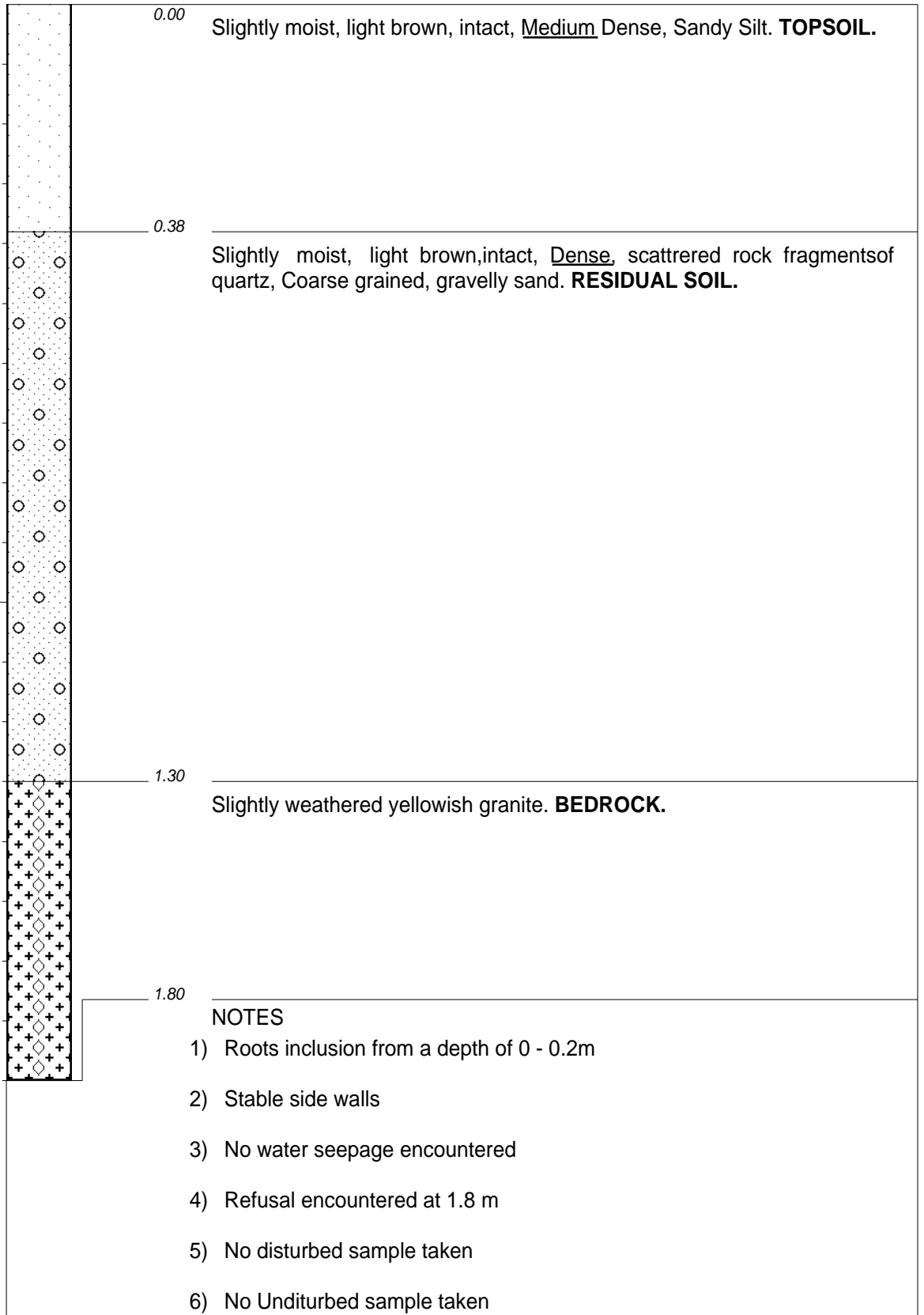


**Nkanivo Development Consultant
Phase 1 Near surface geotechnical investigation**

HOLE No: TP 20
Sheet 1 of 1

JOB NUMBER: 000

Scale
1:10



CONTRACTOR :
MACHINE : Tractor Loader Backhoe (TLB).
DRILLED BY :
PROFILED BY : Mavhetha Lavhelesani

INCLINATION :
DIAM : 0.7 m
DATE :
DATE : 13/11/2020

ELEVATION : 430m
X-COORD : 31°19'4.42"E
Y-COORD : 24°46'41.47"S

TYPE SET BY : Mavhetha Lavhelesani
SETUP FILE : STANDARD.SET

DATE : 30/05/2021 21:59
TEXT : ..00\Examples\Examples.TXT

HOLE No: TP 20

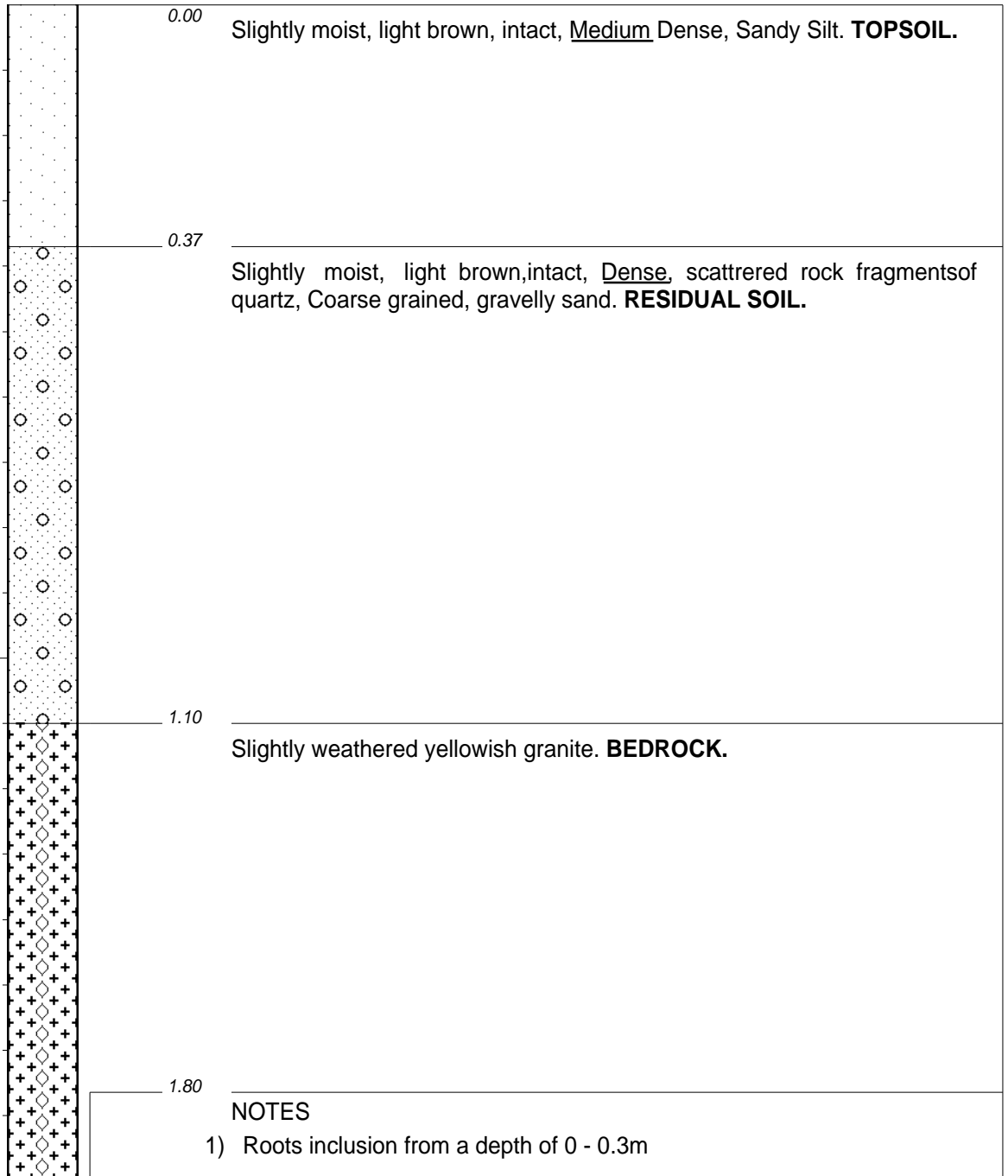


**Nkanivo Development Consultant
Phase 1 Near surface geotechnical investigation**

HOLE No: TP 21
Sheet 1 of 1

JOB NUMBER: 000

Scale
1:10



NOTES

- 1) Roots inclusion from a depth of 0 - 0.3m
- 2) Stable side walls
- 3) No water seepage encountered
- 4) Refusal encountered at 1.8 m
- 5) No disturbed sample taken
- 6) No Undisturbed sample taken

CONTRACTOR :

MACHINE : Tractor Loader Backhoe (TLB).

DRILLED BY :

PROFILED BY : Mavhetha Lavhelesani

TYPE SET BY : Mavhetha Lavhelesani

SETUP FILE : STANDARD.SET

INCLINATION :

DIAM : 0.7 m

DATE :

DATE : 13/11/2020

DATE : 30/05/2021 21:59

TEXT : ..00\Examples\Examples.TXT

ELEVATION : 0m

X-COORD : 31°19'7.70"E

Y-COORD : 24°46'39.73"S

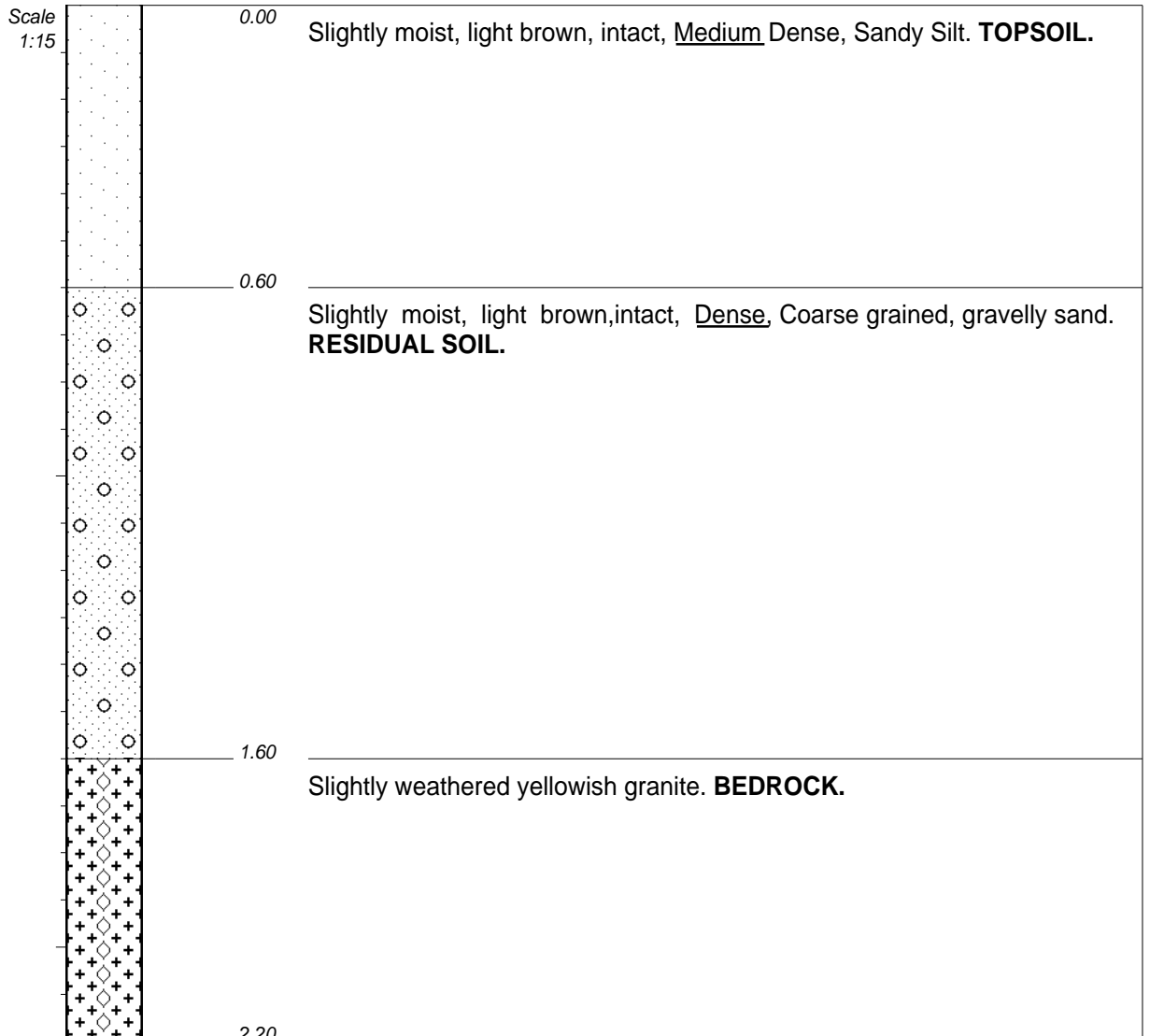
HOLE No: TP 21



Nkanivo Development Consultant
Phase 1 Near surface geotechnical investigation

HOLE No: TP 22
Sheet 1 of 1

JOB NUMBER: 000



NOTES

- 1) Stable side walls
- 2) No water seepage encountered
- 3) Refusal encountered at 2.2 m
- 4) No disturbed sample taken
- 5) No Undisturbed sample taken

CONTRACTOR :

MACHINE : Tractor Loader Backhoe (TLB).

DRILLED BY :

PROFILED BY : Mavhetha Lavhelesani

TYPE SET BY : Mavhetha Lavhelesani

SETUP FILE : STANDARD.SET

INCLINATION :

DIAM : 0.7 m

DATE :

DATE : 13/11/2020

DATE : 30/05/2021 21:59

TEXT : ..00\Examples\Examples.TXT

ELEVATION : 0m

X-COORD : 31°18'8.86"E

Y-COORD : 24°46'44.12"S

HOLE No: TP 22

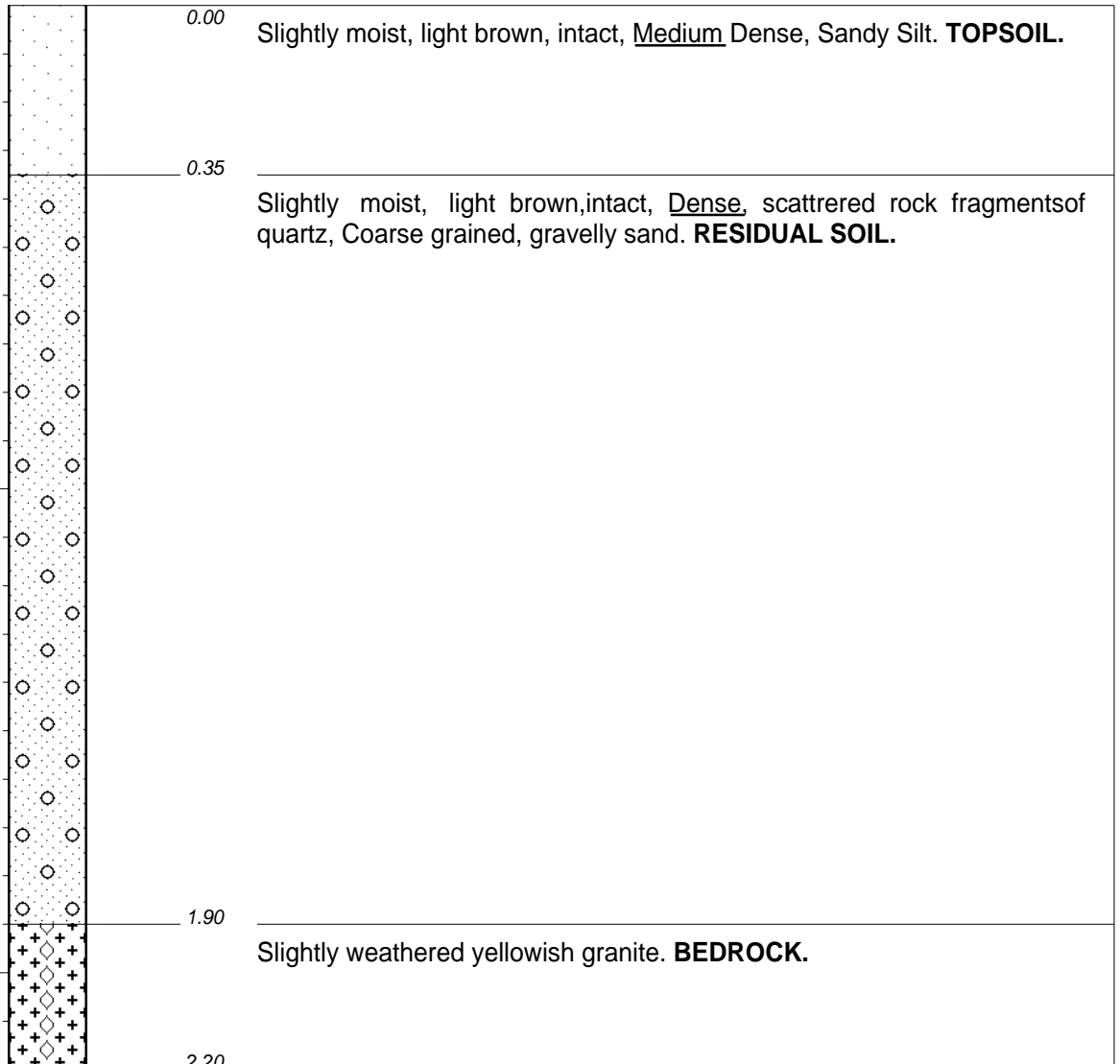


Nkanivo Development Consultant
Phase 1 Near surface geotechnical investigation

HOLE No: TP 23
Sheet 1 of 1

JOB NUMBER: 000

Scale
1:15



NOTES

- 1) Roots inclusion from a depth of 0 - 0.4m
- 2) Stable side walls
- 3) No water seepage encountered
- 4) Refusal encountered at 2.2 m
- 5) No disturbed sample taken
- 6) No Undisturbed sample taken

CONTRACTOR :

MACHINE : Tractor Loader Backhoe (TLB).

DRILLED BY :

PROFILED BY : Mavhetha Lavhelesani

TYPE SET BY : Mavhetha Lavhelesani

SETUP FILE : STANDARD.SET

INCLINATION :

DIAM : 0.7 m

DATE :

DATE : 13/11/2020

DATE : 30/05/2021 21:59

TEXT : ..00\Examples\Examples.TXT

ELEVATION : 434m

X-COORD : 31°19'4.44"E

Y-COORD : 24°46'47.86"S

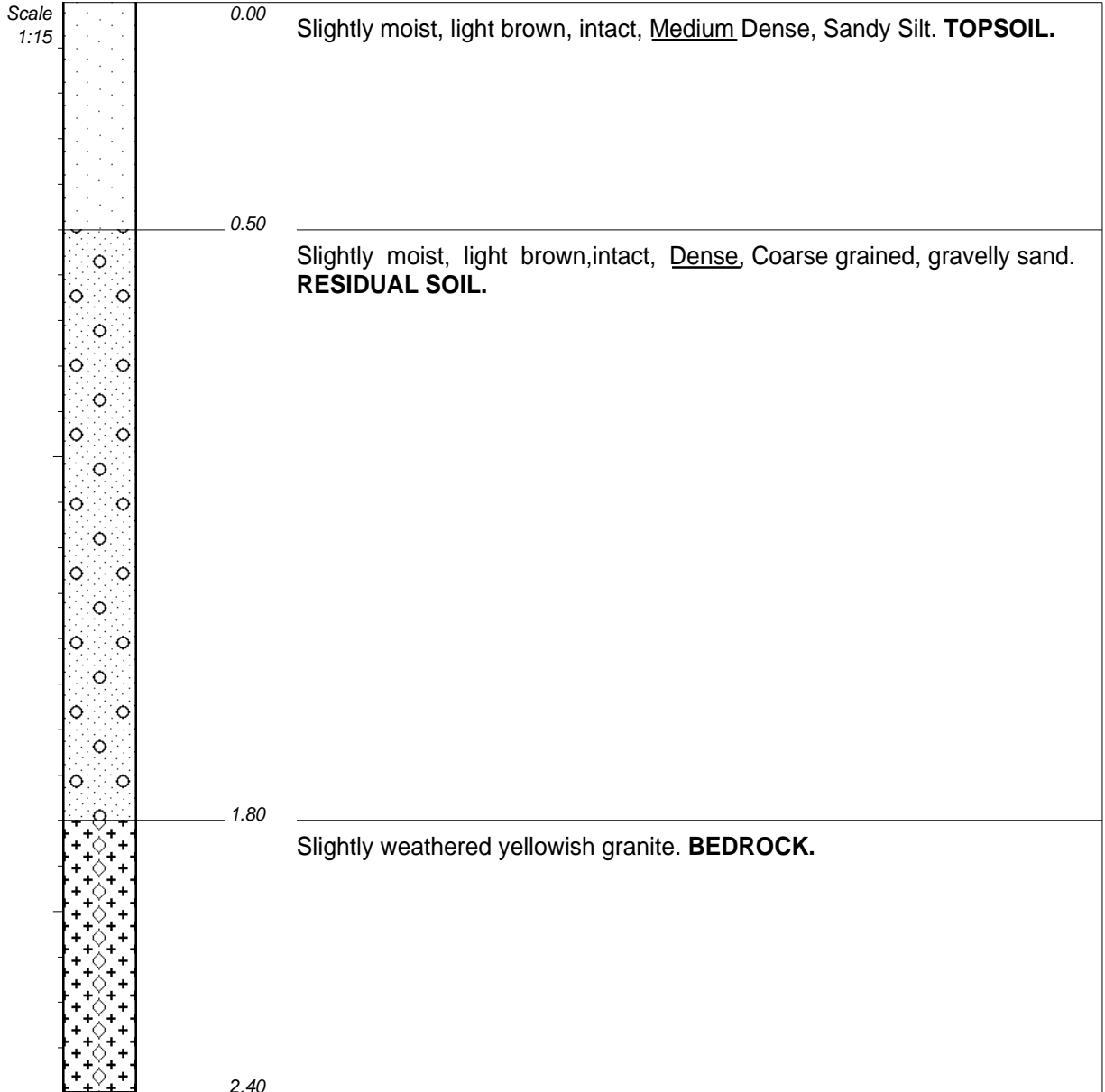
HOLE No: TP 23



**Nkanivo Development Consultant
Phase 1 Near surface geotechnical investigation**

HOLE No: TP 24
Sheet 1 of 1

JOB NUMBER: 000



NOTES

- 1) Roots inclusion from a depth of 0-0.45m
- 2) Stable side walls
- 3) No water seepage encountered
- 4) Refusal encountered at 2.4m
- 5) No disturbed sample taken
- 6) Job title: Phase 1 Near surface geotechnical investigation

CONTRACTOR :

MACHINE : Tractor Loader Backhoe (TLB)

DRILLED BY :

PROFILED BY : Mavhetha Lavhelesani

TYPE SET BY : Mavhetha Lavhelesani

SETUP FILE : STANDARD.SET

INCLINATION :

DIA: 0.7 m

DATE :

DATE : 13/11/2020

DATE : 30/05/2021 21:59

TEXT : ..00\Examples\Examples.TXT

ELEVATION : 436m

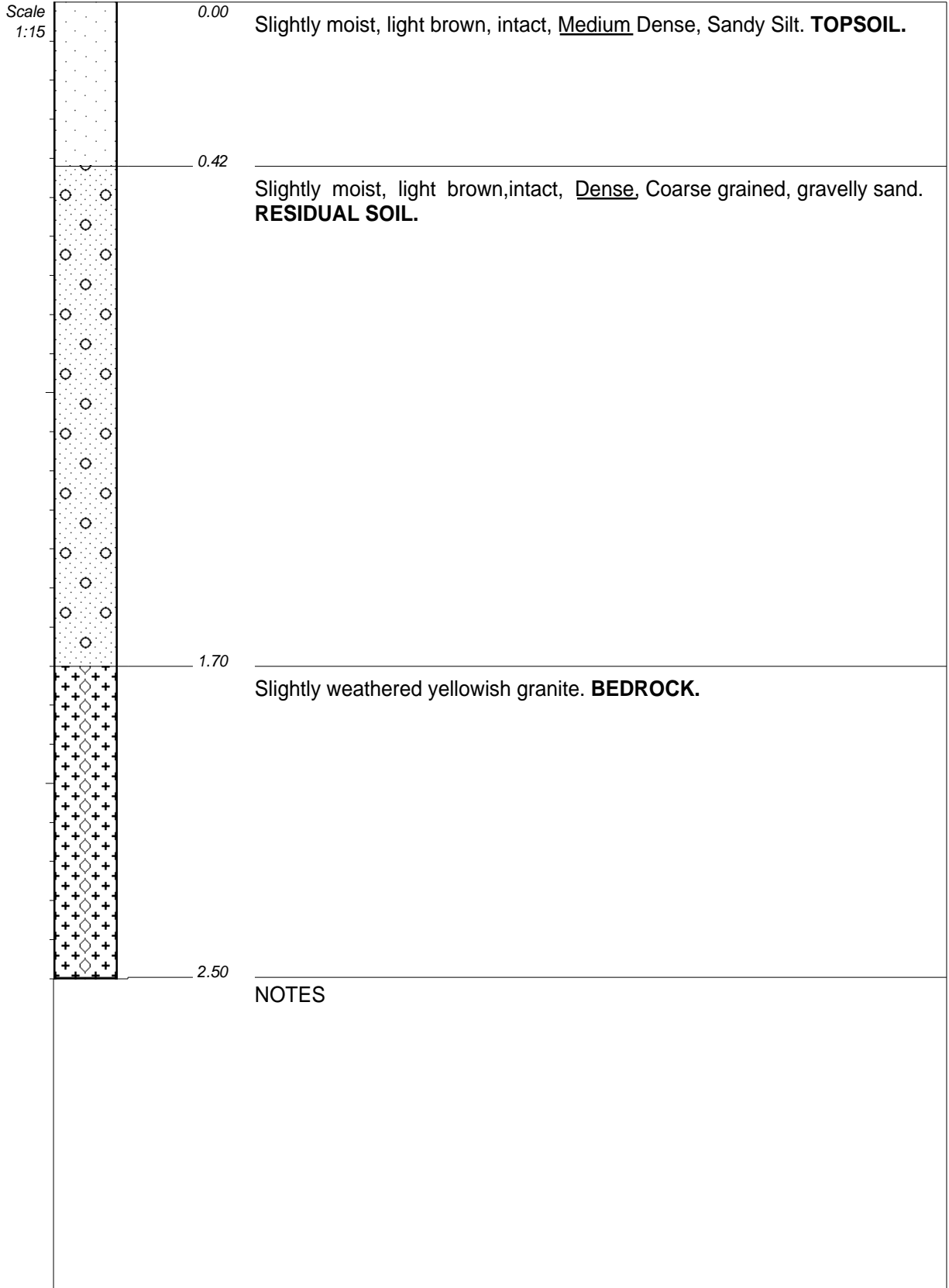
X-COORD : 31°18'57.95"E

Y-COORD : 24°46'55.85"S

HOLE No: TP 24

8) Contractor:

9) Machine: Tractor Loader Backhoe (TLB).



CONTRACTOR :
MACHINE : Tractor Loader Backhoe (TLB).
DRILLED BY :
PROFILED BY : Mavhetha Lavhelesani
TYPE SET BY : Mavhetha Lavhelesani
SETUP FILE : STANDARD.SET

INCLINATION :
DIAM : 0.7 m
DATE :
DATE : 13/11/2020
DATE : 30/05/2021 21:59
TEXT : ..00\Examples\Examples.TXT

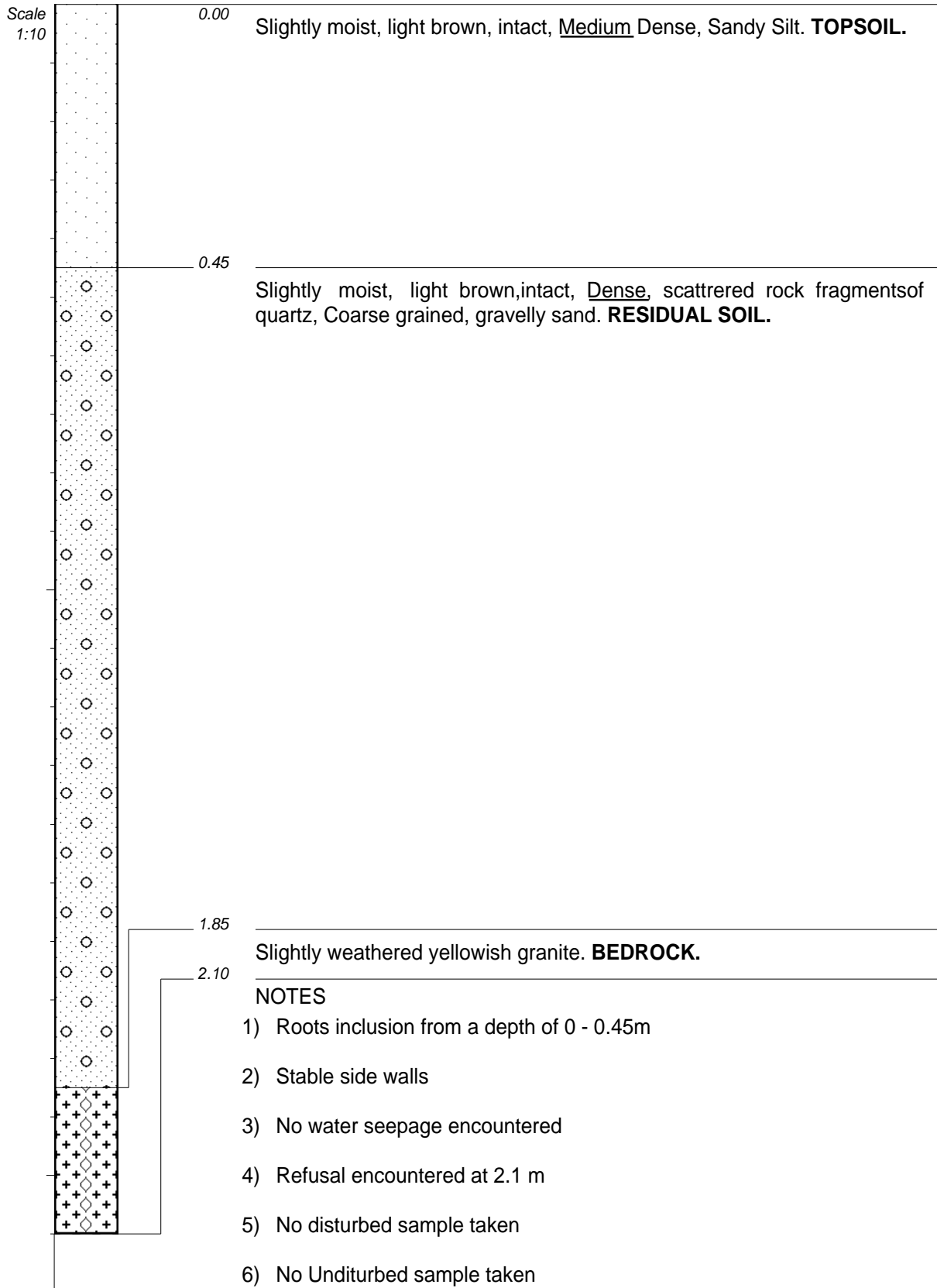
ELEVATION : 430m
X-COORD : 31°18'53.88"E
Y-COORD : 24°46'59.85"S



Nkanivo Development Consultant
Phase 1 Near surface geotechnical investigation

HOLE No: TP 26
Sheet 1 of 1

JOB NUMBER: 000



CONTRACTOR :
MACHINE : Tractor Loader Backhoe (TLB).
DRILLED BY :
PROFILED BY : Mavhetha Lavhelesani
TYPE SET BY : Mavhetha Lavhelesani
SETUP FILE : STANDARD.SET

INCLINATION :
DIAM : 0.7 m
DATE :
DATE : 13/11/2020
DATE : 30/05/2021 21:59
TEXT : ..00\Examples\Examples.TXT

ELEVATION : 445m
X-COORD : 31°18'46.45"E
Y-COORD : 24°46'59.86"S

HOLE No: TP 26

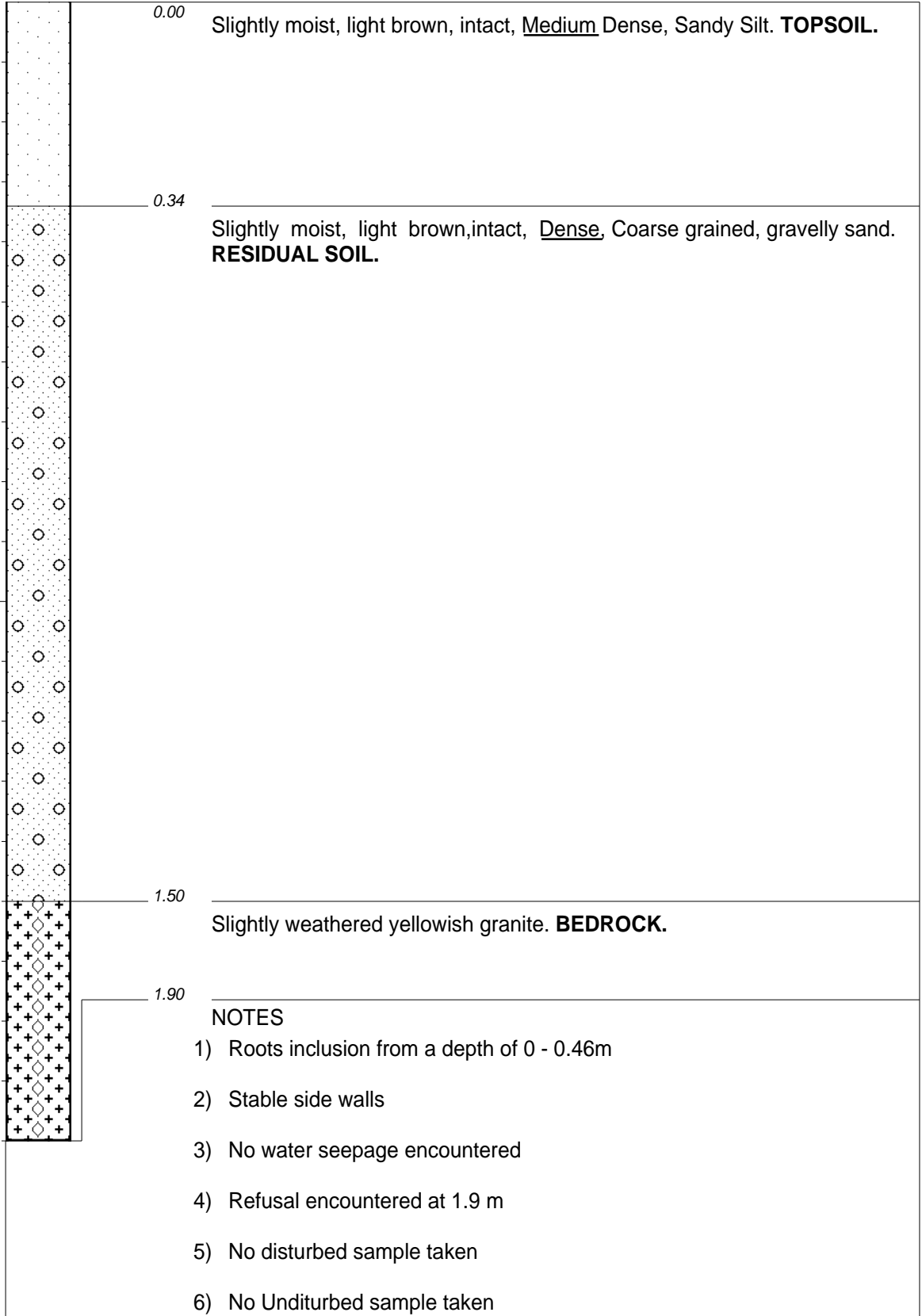


**Nkanivo Development Consultant
Phase 1 Near surface geotechnical investigation**

HOLE No: TP 27
Sheet 1 of 1

JOB NUMBER: 000

Scale
1:10



CONTRACTOR :

MACHINE : Tractor Loader Backhoe (TLB).

DRILLED BY :

PROFILED BY : Mavhetha Lavhelesani

TYPE SET BY : Mavhetha Lavhelesani

SETUP FILE : STANDARD.SET

INCLINATION :

DIAM : 0.7 m

DATE :

DATE : 13/11/2020

DATE : 30/05/2021 21:59

TEXT : ..00\Examples\Examples.TXT

ELEVATION : 454m

X-COORD : 31°18'41.80"E

Y-COORD : 24°47'2.92"S

HOLE No: TP 27



**Nkanivo Development Consultant
Phase 1 Near surface geotechnical investigation**

LEGEND

Sheet 1 of 1

JOB NUMBER: 000

	GRAVELLY	{SA03}
	SAND	{SA04}
	SANDY	{SA05}
	GRANITE	{SA17}{SA44}
Name ●	DISTURBED SAMPLE	{SA38}
5.5 ○ →	WATER SEEPAGE/water strike	{CH50}

CONTRACTOR :
MACHINE :
DRILLED BY :
PROFILED BY :

INCLINATION :
DIAM :
DATE :
DATE :

ELEVATION :
X-COORD :
Y-COORD :

TYPE SET BY : Mavhetha Lavhelesani
SETUP FILE : STANDARD.SET

DATE : 30/05/2021 21:59
TEXT : ..00\Examples\Examples.TXT

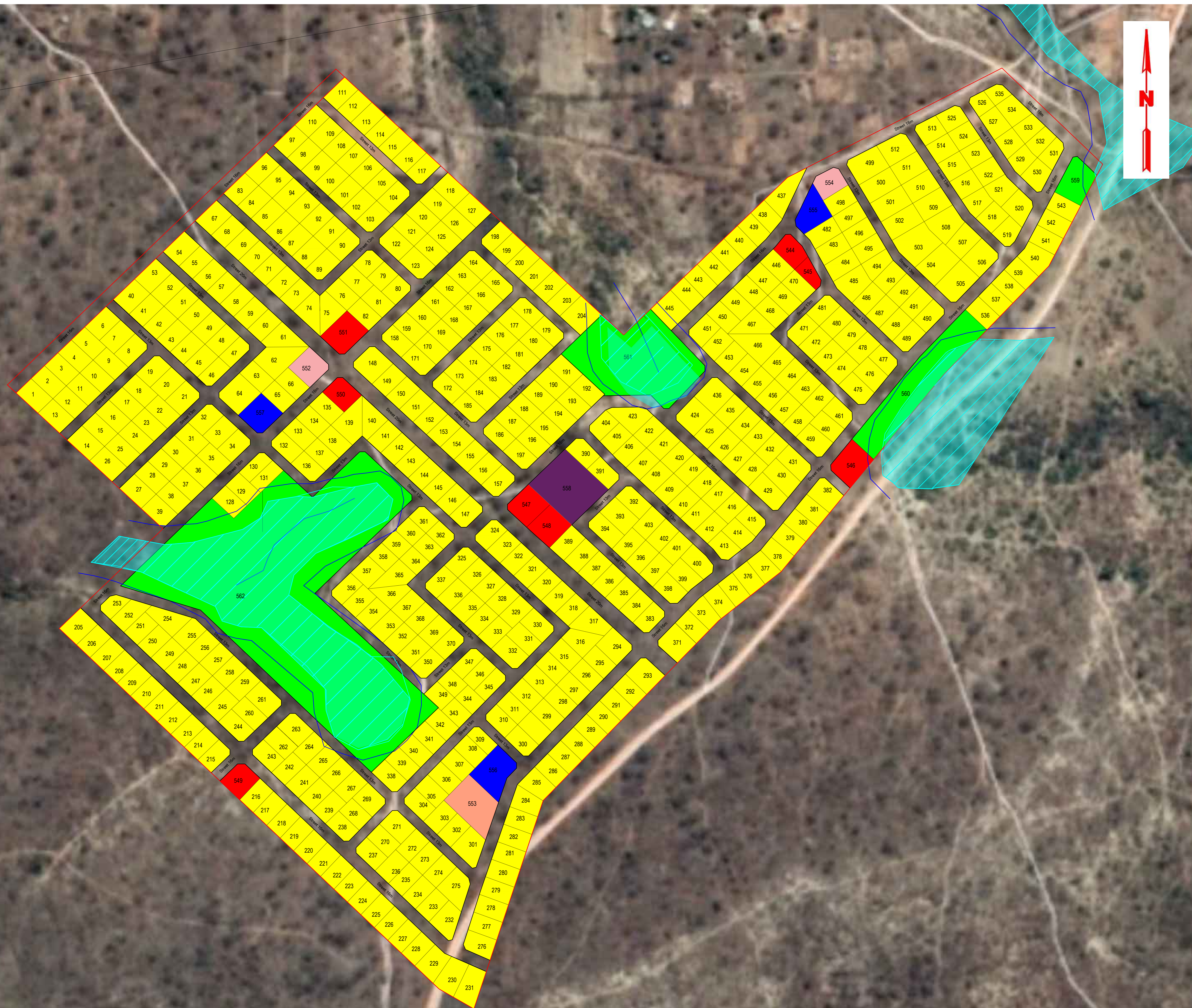
LEGEND
SUMMARY OF SYMBOLS



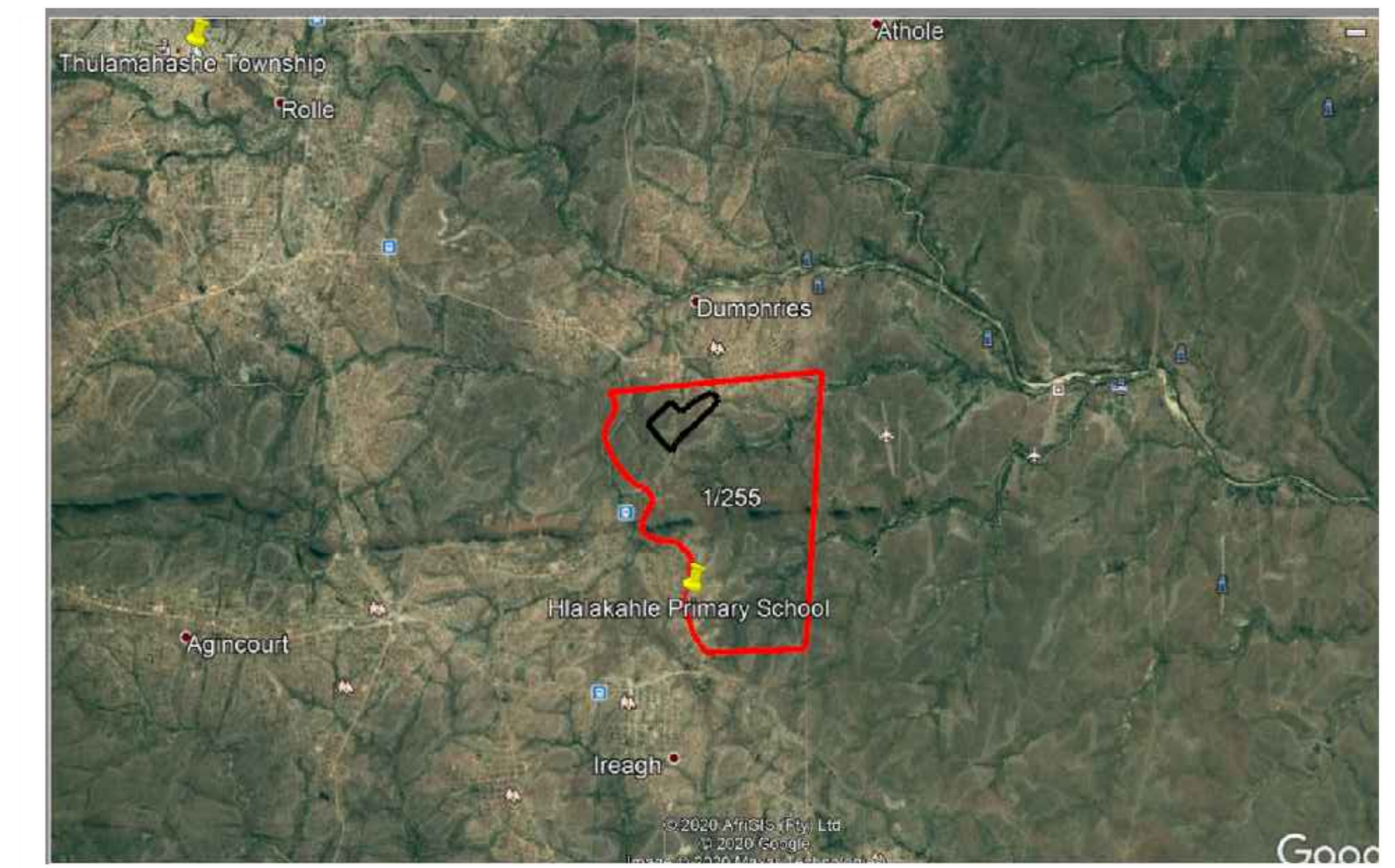
16. APPENDIX D: SITE LAYOUT PLAN

DEMARCATION LAYOUT PLAN

PORTION 1 OF THE FARM NEWINGTON 255 KU



LOCALITY MAP



ZONING	LAND USES	NO. OF ERF	AREA (HA)	AREA (%)	NOTATION
RESIDENTIAL 1	DWELLING UNIT	543	56.84	64.29	Yellow
BUSINESS 1	RETAIL	8	1.22	1.38	Red
INSTITUTIONAL	CRECHE	3	0.59	0.68	Blue
INSTITUTIONAL	CHURCH	3	0.60	0.68	Pink
GOVERNMENT/MUNICIPAL	MULTI-PURPOSE CENTRE	1	0.55	0.62	Purple
PUBLIC OPEN SPACE	PUBLIC OPEN SPACE	4	10.24	11.58	Green
ROADS PURPOSES			18.37	20.78	
TOTAL DEVELOPABLE AREA		562	88.41	100%	

NOTES:

1. ——— Represents Proposed Township Boundary.
2. All areas and distances are approximate and subject to final survey
3. Average Residential Stand Size 1000 sqm
4. Street Width :13m, 16m, 20m
5. Ecological Sensitive Areas
6. Buffer Sensitive Area

SURVEY NOTES:

CLIENT:
BUSHBUCKRIDGE LOCAL MUNICIPALITY



CONSULTANTS	NAME	SIGNATURE
TOWN PLANNER (NKANIVO DEVELOPMENT CONSULTANTS)	SAMUEL CHAUKE	
FLOOD LINE ENGINEER (-)		
LAND SURVEYOR (WINDUS M & ASSOCIATES SURVEYS)		
CONSULTING ENGINEER (-)		
DESIGNED: SAMUEL CHAUKE Tech.Pln (-)	THESE DRAWINGS: (A) ENJOY COPYRIGHT PROTECTION AND THE COPYRIGHT VESTS IN NKANIVO DEVELOPMENT CONSULTANTS UNLESS OTHERWISE AGREED IN WRITING (B) MAY NOT BE REPRODUCED OR TRANSMITTED IN ANY FORM OR BY ANY MEANS WHATSOEVER TO ANY PERSON WITHOUT THE WRITTEN PERMISSION OF THE COPYRIGHT HOLDER	
CHECKED: SAMUEL CHAUKE		
DRAWING No: 2020DU-001 DATE: 04/12/2020		

SCALE 1: 2000(A0)
SCALE 1: 4000(A2)

COMPILED BY:



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